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ABSTRACT

The revised Iowa Developed Energy Activity Sampler (IDEAS) was compiled using the original IDEAS program and the Energy Conservation Activity Packets (ECAPS). This booklet provides activities for teachers in the intermediate elementary grades (3-5) and is designed to enable students to develop a comprehensive understanding of energy concepts. Each of the 26 activities include: (1) the subject area for which the activity was intended; (2) the grade level; (3) a brief descriptive statement about the activity itself; (4) the objective(s); (5) a list of materials needed; (6) the approximate amount of time needed for the activity; (7) a more complete description of the activity, including the various components of the activity and their relationship to Piaget's learning cycle (awareness, concept development, application); and (8) some follow-up/background information. The focal points of the document are energy concerns, impacts, choices, challenges, and conservation. (TW)

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Iowa Developed Energy Activities Sampler

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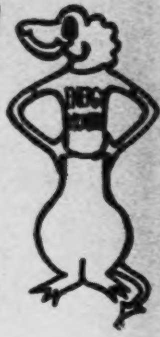
Energy Conservation Activities for Elementary Grades



(Or: How to Help Slim Down the Energy Monster)

SE047509

Intermediate 3-5

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REVISED IOWA DEVELOPED ENERGY ACTIVITY SAMPLER -IDEAS

INTRODUCTION TO IDEAS

The revised IDEAS were developed from the Energy Conservation Activity Packets, (ECAPS), by Ruth Bakke, and Iowa Developed Energy Activity Sampler, (IDEAS), developed by Dr. Doris G. Simonis under the auspices of the Iowa Energy Policy Council and the Iowa Department of Public Instruction. An "infusion model" was used as a basic framework which recognized the interdisiplinary nature of energy education concepts. These included:

1. Energy is basic.
2. Energy usefulness is limited.
3. Environment is impacted by energy exchanges.
4. Energy conservation is needed.
6. The future of energy is ours to shape and share.

The revised IDEAS adheres to these concepts and provides activities that utilize a learning cycle to develop a knowledgeable student population concerning energy matters. Decision-making skills are emphasized and developing an energy conservation ethic is a major goal.

Under the joint sponsorship of the Iowa Department of Education, Duane Toomsen, Environmental and Energy Education Consultant, and the Energy Division of the Iowa Department of Natural Resources, Dr. W. Tony Heiting, Coordinator; the revised Iowa Developed Energy Activity Sampler (IDEAS) was created to meet the continuing need for energy education from the 1980's into the twenty-first century.

Conservation of natural resources and environmental awareness has been mandated by the State of Iowa to become a part of the quality education experienced by Iowa's future citizens in grades K-12. Energy is an integral part of our nation's natural resource base. The major emphasis of IDEAS is to provide uniquely designed K-12 classroom activities that are adaptable into various classroom situations, ie., highly populated, urban schools to less populated rural facilities. The focal points of IDEAS are: energy concerns, impacts, choices, challenges, and conservation.

Revised IDEAS adopts the learning cycle strategy from the learning theory of Jean Piaget. The cycle has three phases: awareness, concept development, and application. Awareness activities encourage students to observe a new idea or phenomenon. Activities are loosely structured to allow for student exploration, hypothesizing, and decision making. Concept development involves the creation of a concept based on experiences from the awareness phase. Concept development may include such activities as reading text or library material, performing experiments, solving problems, group interactions, etc., in order to reinforce the developing concept. The application phase is designed to enable the student to take a newly learned concept and apply it to a different situation or problem. Application activities may include such things as debates, problem solving, simulations, hands on experimentation, and other strategies to reinforce the concept recently developed.

This learning cycle approach integrates content with processes and encourages the development of higher level reasoning and thinking skills. The interdisciplinary importance of energy education is emphasized.

Iowa is an excellent example of how energy is an interrelated and interdependent resource. Iowa imports 98% of the energy it uses and has a high potential for reducing its dependence on outside energy sources through conservation and alternative energy forms. Iowa's current energy dependence has a major impact on Iowa's economy and the ability of the state to compete in the industrial and agricultural community. All segments of Iowa's society involving service-related employment, agriculture, and industry, are impacted by energy costs and availability.

The most obvious means of energy reduction is energy conservation. More efficient use of energy resources available in Iowa (ie. coal, wind, hydro, solar, gasohol, biomass,) can have a significant impact on the cost of production/distribution factors as fossil fuels begin to diminish in the twenty-first century.

The revised IDEAS were developed by classroom teachers who realize the need to provide students with an enriched curriculum. Iowa's tradition of excellence in education has always pointed toward an improved future for our youth. IDEAS will provide the creative educator with a multitude of activities from which they can choose, adapt, and improve.

The professional educator who uses IDEAS may adapt the activities for any classroom setting. Students will be given the basis to form an energy attitude, ethic, and philosophy which will serve them and the citizens of Iowa throughout life.

Members of the IDEAS-ECAPS Revision Committee

Duane Toomsen, Environmental and Energy consultant, Department of Education

Dr. Tony Heiting, Research/Education Director, Energy Division, Iowa Department of Natural Resources

The following were responsible for the grade and/or subject level indicated:

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INTERMEDIATE INTRODUCTION

The intermediate materials were designed to enable the student to develop a comprehensive understanding of energy concepts and choices. Activities are loosely ordered to provide a sequential flow of energy information. It is desirable, but not essential, to present the activities in the order given.

The activities are composed of concrete, hands-on activities in the learning cycle format. Each student should keep the activities in an energy folder. Throughout the entire unit, the students will examine their own lifestyles, form opinions (values), make choices, and develop a conservation ethic.

The intent of these materials is for the teacher to use this unit as a springboard for the student's lifetime commitment to a conservation ethic starting in the school and continuing throughout life.

A special thanks to the following people for their contribution to the project.

Marilyn Benson	-Fremont Mills Community School District
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Sindy Stiles	-Fort Dodge Community School District
Pam Pandil	-Fort Dodge Community School District
Duane Toomsen	-Department of Education
Rose Marie Wilson	-Sheldon Community School District

TITLE Energy Dramatics

SUBJECT Creative Dramatics/Science **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students "act out" and design symbols of the major energy sources.

OBJECTIVE

Students will review the main sources of energy.

MATERIALS	TIME
energy source name tag for each student	awareness - 20 minutes
oak tag for energy mobile	concept development - 30-45 min.
folder for each student	application - 30-45 min.

LEARNING CYCLE

AWARENESS - The name of a different energy source is taped on each child's back (petroleum, natural gas, coal, water, nuclear, solar, wind). To find out what the energy source is, the student must go about the room asking questions of other classmates. After the students know what their energy source is, they gather in groups according to their common energy source.

CONCEPT DEVELOPMENT - Each group invents a way to show to the rest of the class the energy source they represent by way of dramatics, human sculpture, sound effects, etc.

APPLICATION - Each group will design a symbol for their energy source. Each symbol could be drawn on a circle of oak tag to be part of an energy source mobile (to be displayed throughout the energy unit).

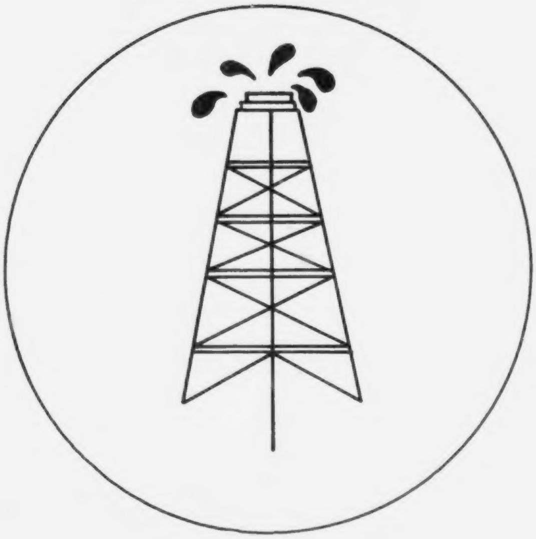
OR

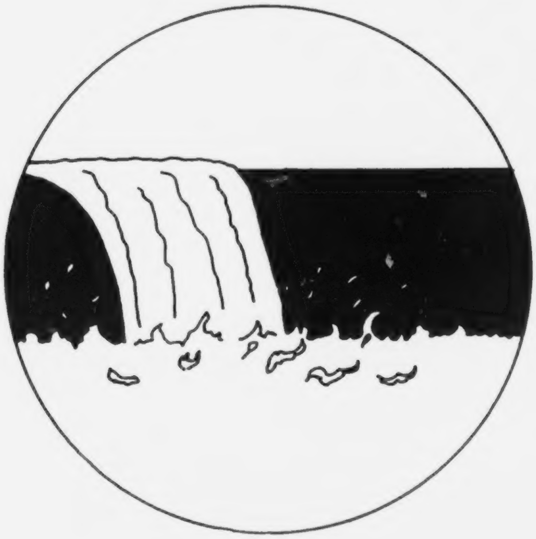
Each student can design on a cover for their energy booklet using energy source symbols. Each child will need a folder or notebook for energy information gathered during the unit.

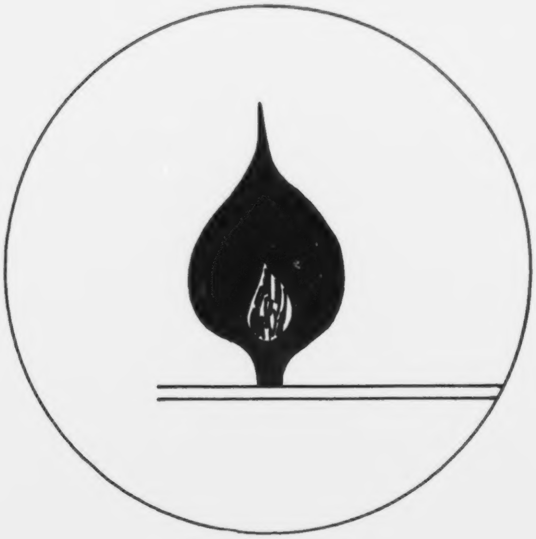
FOLLOW-UP/BACKGROUND INFORMATION

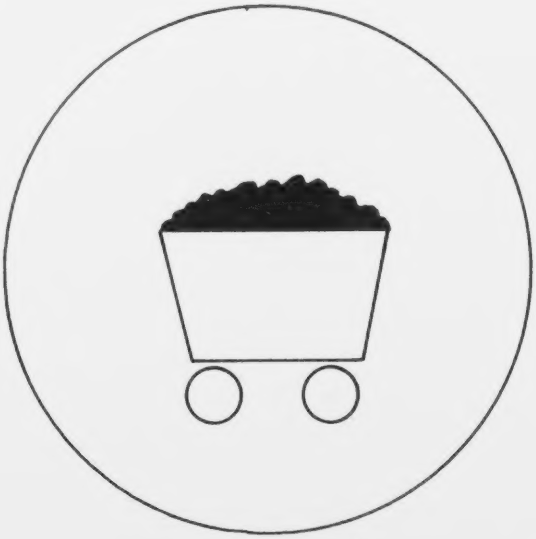
The primary energy source is, of course, the sun. Our main energy sources (for heating and cooling, and for production of electricity) are natural gas, coal, petroleum, nuclear fission, wind, solar, and moving water. Other less utilized energy sources are nuclear fusion, biomass, sea gradient, and geothermal energy. Our Energy Needs handout (see 1b) can be used to expand thinking about energy and sources.

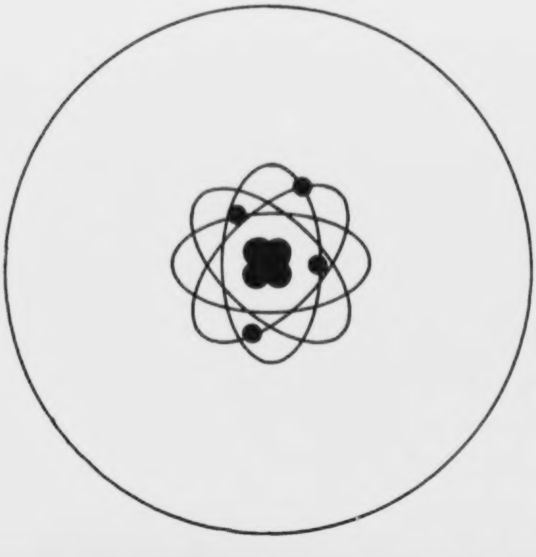
SOURCE OF ACTIVITY Janey Swartz

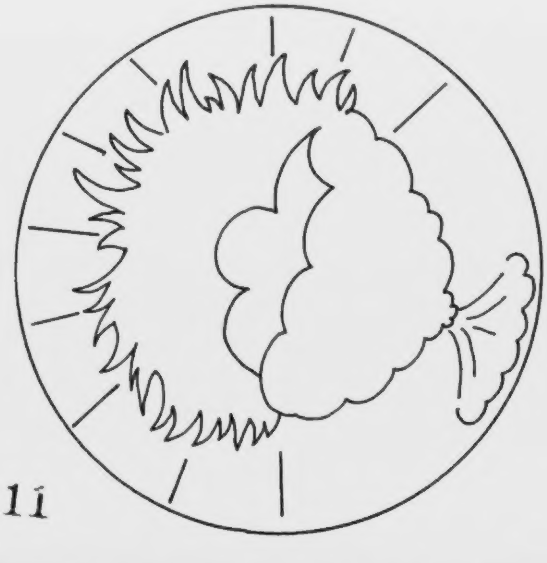












OUR ENERGY NEEDS

You will find below, the beginning of a list of energy users. Please add to this list. Think about each item and place an "x" in the column under the form of energy that powers the user. Some of the users run on more than one type of energy.

Energy User	Electricity	Coal	Natural Gas	Oil	Battery	Sun
clock	X				X	
green plant						
television						
stove						
furnace						
radio						
flashlight						
lamp						
refrigerator						

TITLE Invent-A-Machine

SUBJECT Science, Art **LEVEL** Intermediate

ACTIVITY IN BRIEF

The students invent a machine to do work.

OBJECTIVE

Students will be able to describe energy as the ability to do work. They also will be able to name the various forms of energy (heat, electrical, chemical, energy of motion and light) in different examples.

MATERIALS	TIME
handouts (2a) items to be collected at home	Awareness - 15 minutes Concept Development - 30 to 60 min. Application - Variable

---

LEARNING CYCLE

AWARENESS - A list is made of items which contain energy, i.e. each item is "powered" by some form of energy. Look at the pencil sharpener model and describe each form of energy used (heat, electrical, chemical, energy of motion, or light). (see 2a)

CONCEPT DEVELOPMENT - The student draws plans for a machine which will do "work". The machine must be "powered" by one or more of the forms discussed in the awareness activity.

APPLICATION - The students will share their plans with their classmates. Students are encouraged to bring "machines" from home to demonstrate how machines do work.

FOLLOW-UP/BACKGROUND INFORMATION

—Heat energy can be observed in a thermometer. The heat "moves the mercury".Heat also cooks our food. Heat boils water, fries an egg, etc.

—Light energy (the sun) creates a chemical reaction in green plants converting light energy to simple sugars by a process called photosynthesis.

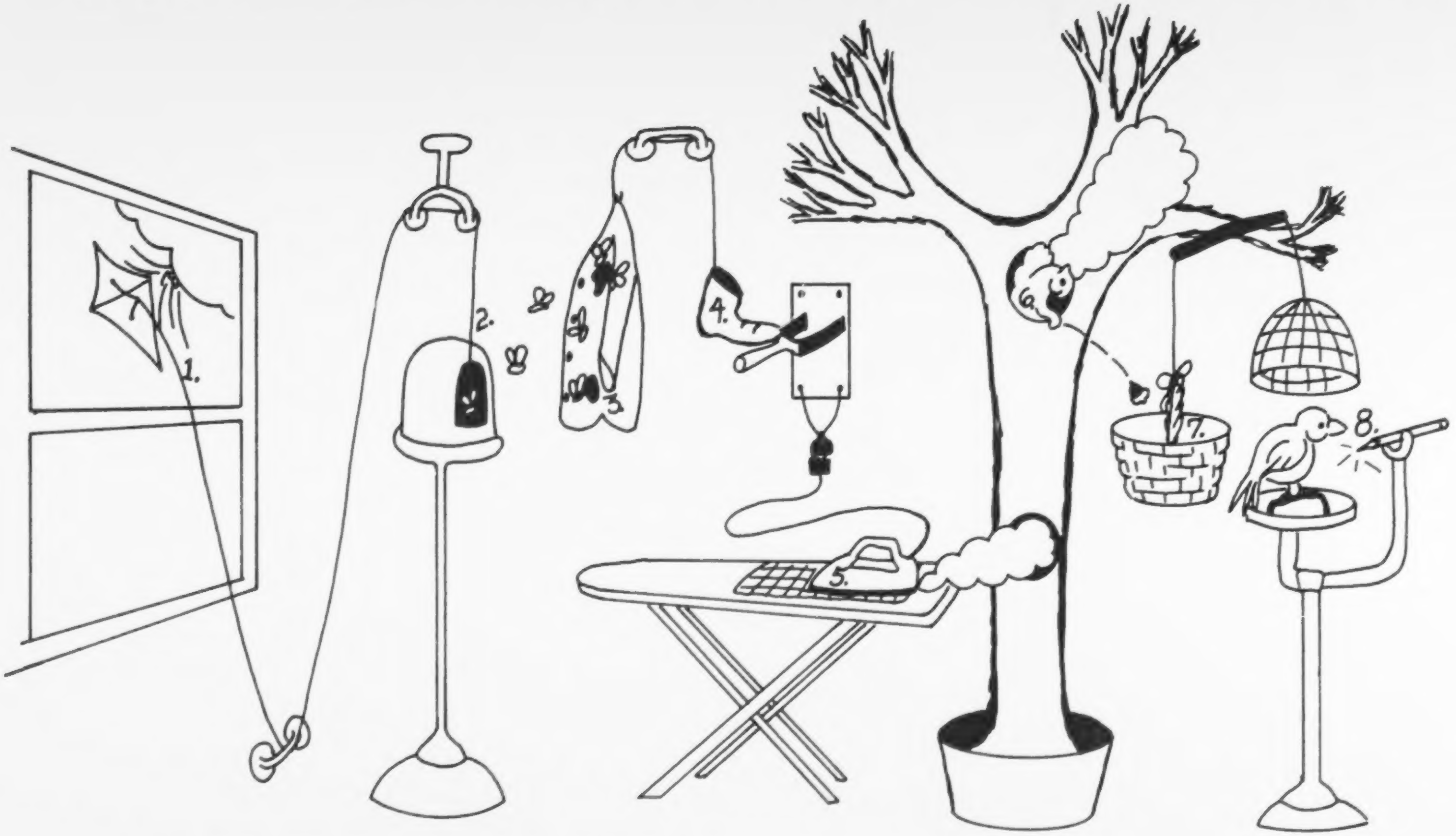
—Chemical energy can be observed in a flashlight batter. (chemical energy converting to light) A body moving is an example of chemical energy whereby food is converted into energy.

—Any object in motion has energy. Wind, falling water, and falling bodies have the ability to move things. A spring in a wind up toy has potential energy until it is released and becomes kinetic energy or energy in motion. Sound is a form of energy in motion. A guitar string is plucked, air is set into motion and we hear.

SOURCE OF ACTIVITY

Adapted from Inventor's Workshop by Janey Swartz

Model of a Simplified Pencil Sharpener



Name the kind of energy used in each step along the way.

1. ______________________________

2. ______________________________

3. ______________________________

4. ______________________________

5. ______________________________

6. ______________________________

7. ______________________________

8. ______________________________

TITLE My, How You've Changed

SUBJECT Science, Reading **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students will watch for chemical changes in plant matter (decaying leaves, a banana peel turning brown, and wood changing to charcoal). They will describe how coal, petroleum, and natural gas were formed millions of years ago.

OBJECTIVE

Students will be able to tell the fossil fuel formation story.

MATERIALS	TIME
handouts - I-3a, I-3b	awareness - 30-45 minutes
experiment materials - see I-3a	concept development - 20 minutes
lump of coal	application - 60 minutes
banana peel	
soil in a can - paper	

LEARNING CYCLE

AWARENESS - Students discuss what happens to plants (leaves, trees, etc.) after they die and fall to the earth. Concrete examples of a rotting log, decaying leaves, etc., might be shown. Cover a banana peel to watch the changes in structure. Do the experiment with wood changing to coal. (See 3a)

CONCEPT DEVELOPMENT - Students are shown a lump of coal. They are told that it was once a plant. Students will describe how they think coal is formed in the earth. The children look at the picture and read the fossil fuel formation story. (See I-3b - "Millions of Years Ago")

APPLICATION - Students create a class diorama showing what the earth might have looked like during the period when fossil fuels were formed.

FOLLOW-UP/BACKGROUND INFORMATION

It should be stressed that we are currently using fossil fuel resources a million times faster than the natural systems can produce them.

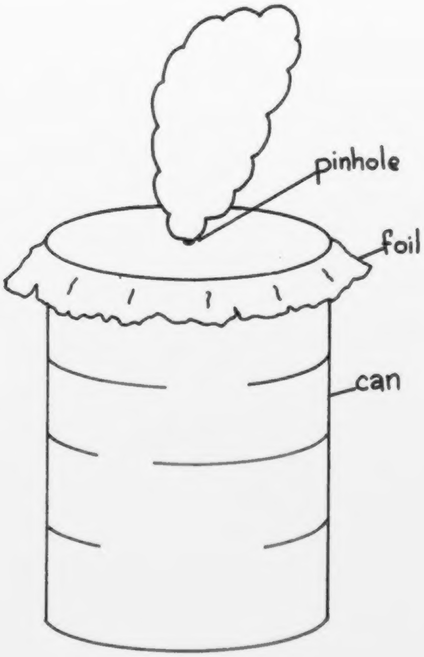
SOURCE OF ACTIVITY

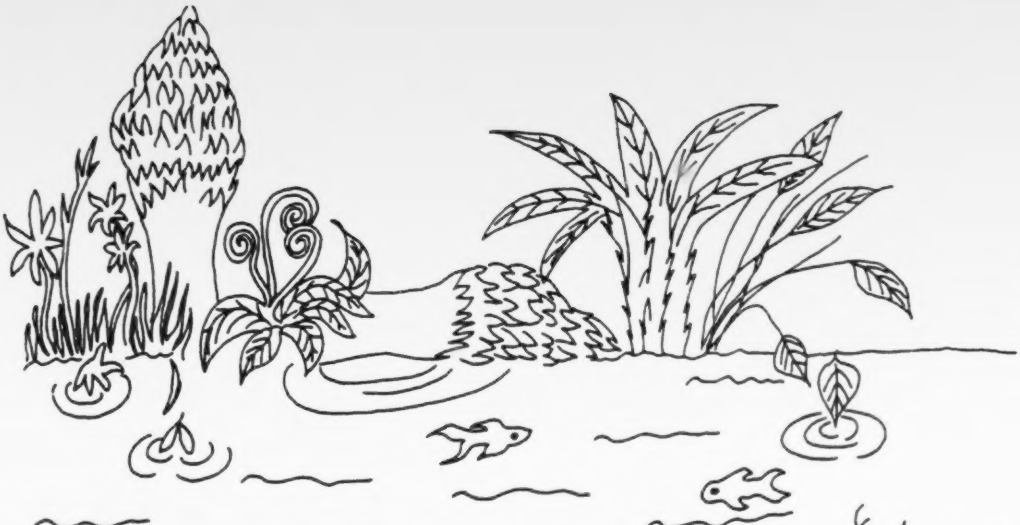
Adapted from Watt's Happening

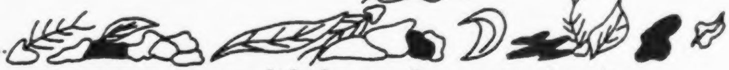
Mini-Charcoal Maker

1. Collect these materials:
    - tin can with foil cover (with a pinhole in it)
    - portable camp stove
    - wood shavings
    - potholder
    - matches

2. Put the wood shavings in the can. Cover the can with the foil.
3. Put the can on the stove; turn the stove on medium heat.
4. Watch the smoke being driven from the wood by the heat.
5. Light the gas escaping from the pinhole.
6. Keep heating the can, until the flame goes out completely and cannot be lit again.
7. After the can has cooled, remove the lid. You will find pieces of black CHARCOAL inside. (Charcoal is almost pure carbon)
8. Light the charcoal and see how it burns.

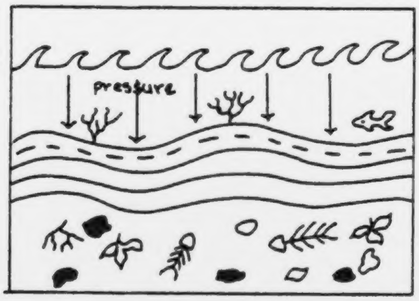


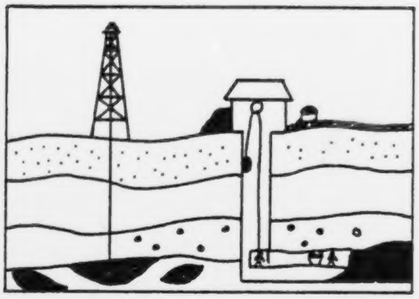


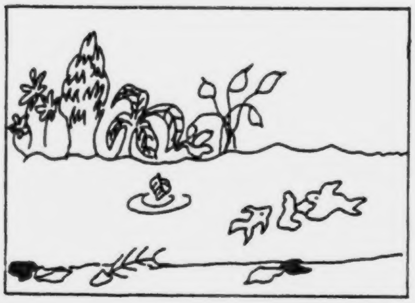
Millions of Years ago.... 

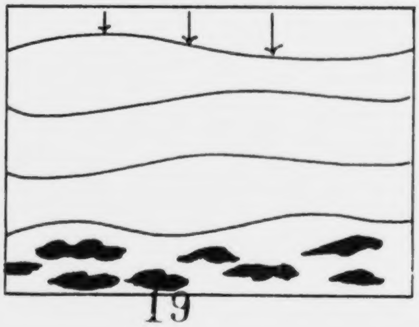
most of the U.S.A. was a swamp with large ferns and other unusual plants and animals. When they died, the plants and critters sank to the bottom of the swamp. Hundreds and hundreds of years went by and the dead plants and animals got covered with mud and sand. The swamps dried up and the mud, sand, rock, and soil pressed and pressed and pressed and pressed and pressed and squeezed and squeezed and squeezed all those dead, decaying, rotting, squishy, oozy plants and animals and changed them into coal, petroleum, and natural gas!!

Number the pictures below in the proper order.

☐ 

☐ 

☐ 

☐ 

TITLE Dig It

SUBJECT Social Studies, Reading, Art, Writing

LEVEL Intermediate

ACTIVITY IN BRIEF

Students predict and extract chocolate chips found in a chocolate chip cookie. Underground mining and strip mining (pros and cons) are explored.

OBJECTIVE

Students will be able to describe the 2 kinds of mining (strip and underground). They will be able to categorize advantages and disadvantages of mining and using coal. They will also be able to map where the coal reserves are in Iowa and in the USA.

MATERIALS

chocolate chip cookies
napkin for each student
handouts I4a, I4b, I4c, and I4d

TIME

Awareness - 30 to 45 min.
Concept Development - 1 to 2 hours
Application - 2 sessions of 45 to 60 minutes each

LEARNING CYCLE

AWARENESS - Students are presented with a chocolate chip cookie placed upon a napkin before them. They are instructed that each chip represents a coal deposit. They visually observe and predict the number of chips in the cookie on their napkin. They are instructed to mine the cookie and extract the chips. They compare the number removed with their prediction. Students are informed that to mine coal, they must file an environmental impact statement, and restore the land to its original form. They are then given a second cookie and instructed to make their prediction and to do their mining with minimal damage. Students' predictions for each mined cookie are charted on the chalkboard.

CONCEPT DEVELOPMENT - A picture is shown of both mining techniques (see I4a). Statements relating to coal mining are read, and the student determines if each is a disadvantage or an advantage. They will find where they live on coal distribution maps (I4b, I4c). The students will look at the picture (I4d) and talk about the causes and effects of ACID RAIN. The students will color the picture (They are encouraged to add to the picture). Each student will take a character (tree-lake-fish-cornfield-statue in a park-deer-bird, ect.) and either make a picture or write a story from that character's point of view.

APPLICATION - Students do the "What's on Your Mind" activity (see I4d). A mock town meeting is held to hear the various views regarding the mining of a known coal reserve outside the town. A city "council", after hearing all the viewpoints, must agree on a plan regarding what regulations must be applied if and when mining begins.(see Background Information)

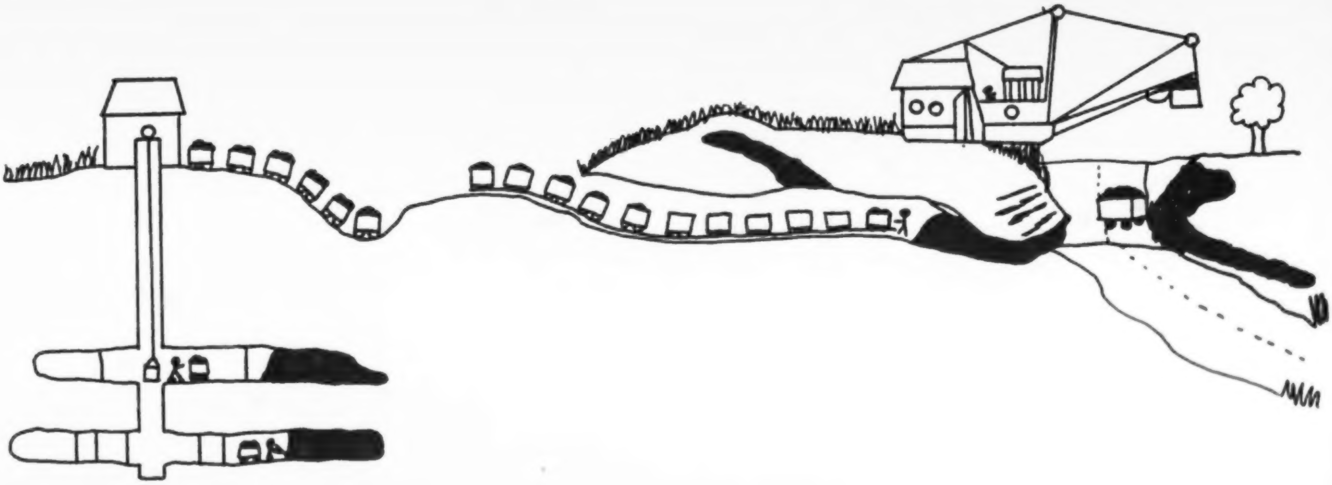
FOLLOW-UP/BACKGROUND INFORMATION

Committees are formed of representatives of each faction (doctors, naturalists, citizens, miners, teachers, machine operators, "wildlife"). Each group gathers its "ammunition" and elects a speaker to represent the group at the council meeting. The teacher may want to choose the city council, (perhaps a mayor too?) and the various groupings so all the viewpoints can be represented.

SOURCE OF ACTIVITY

Adapted from Outlook by Janey Swartz

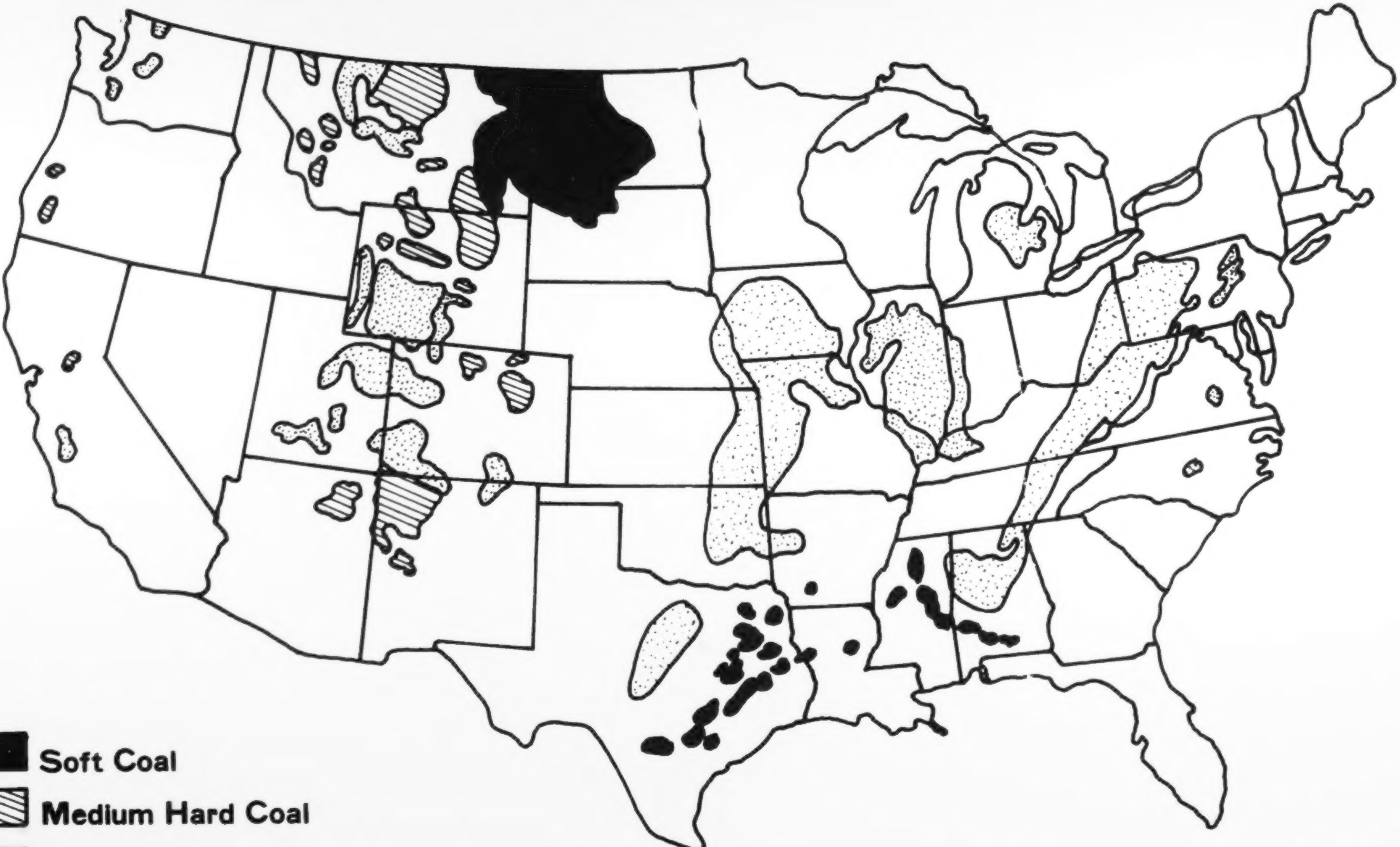
DIG IT!



Coal will eventually run out.
Underground mines can cause black lung disease.
Coal can help make electricity.
Mining provides jobs.
The burning of coal causes air pollution and contributes to acid rain.
There is more coal left than there is oil or natural gas.
Strip mining can damage the environment.

Advantages of Coal Mining	Disadvantages of Coal Mining

U.S. COAL SUPPLY LOCATIONS



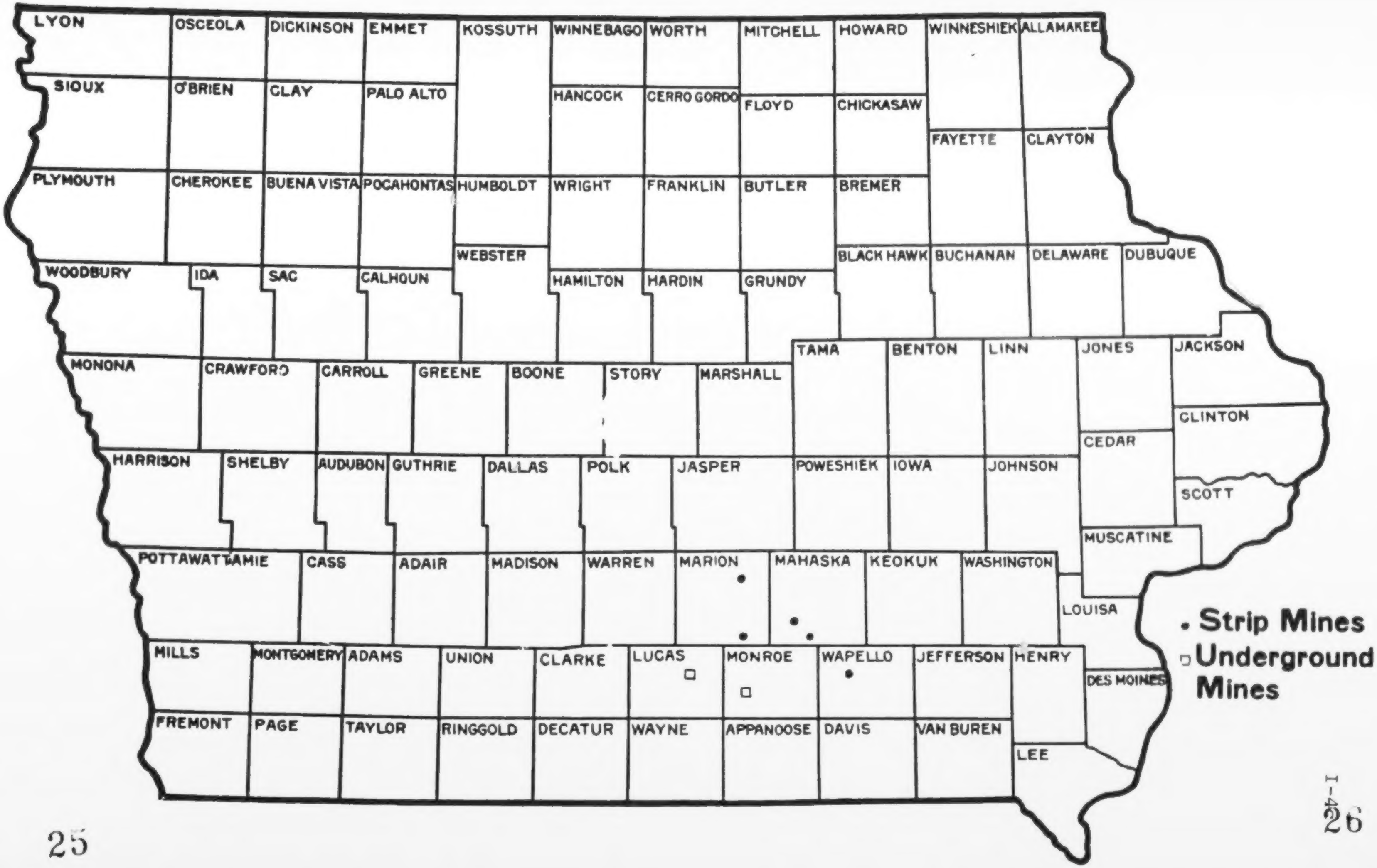
■ **Soft Coal**

▨ **Medium Hard Coal**

░ **Hard Coal**

I-4b

IOWA COAL MINES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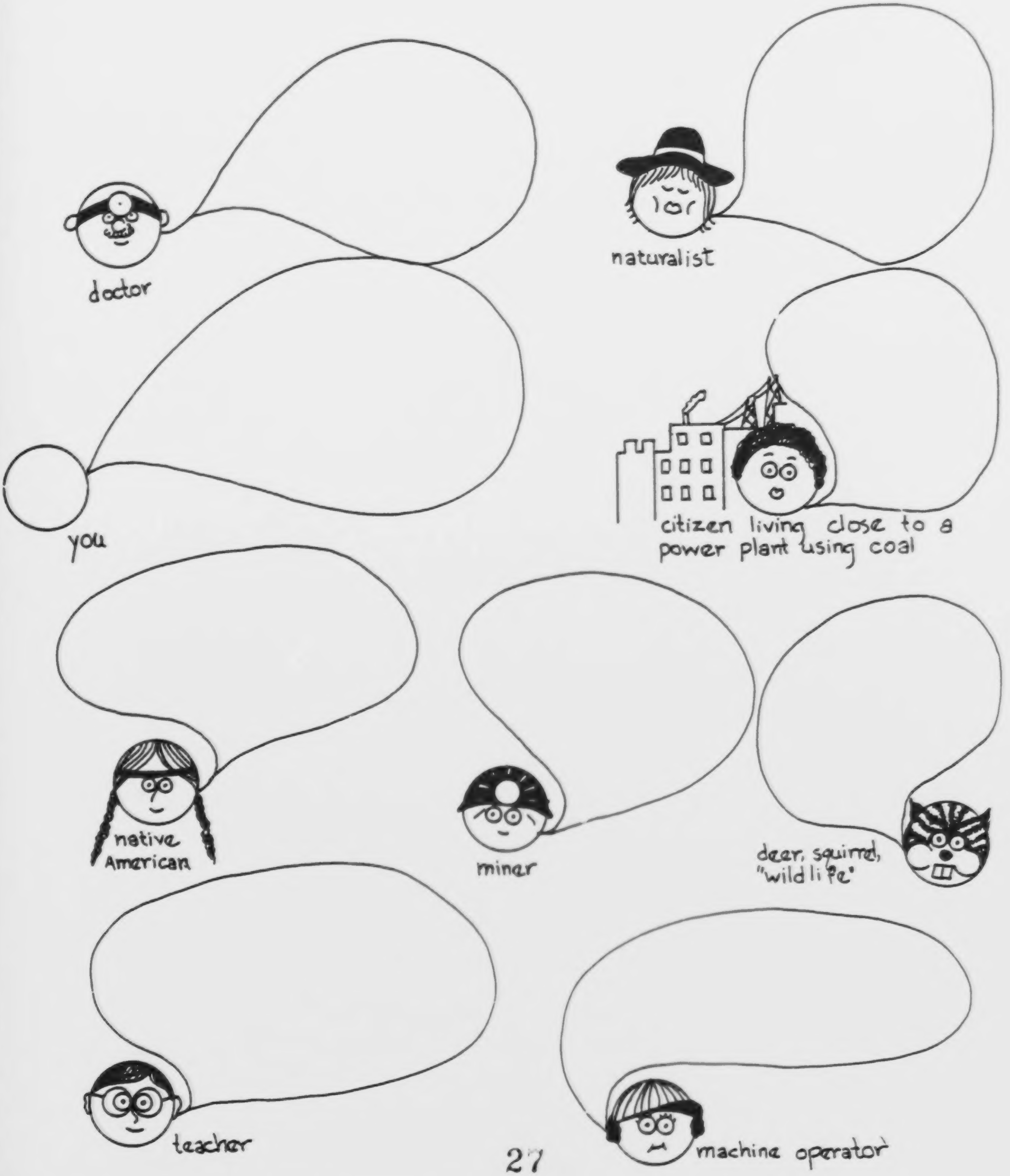
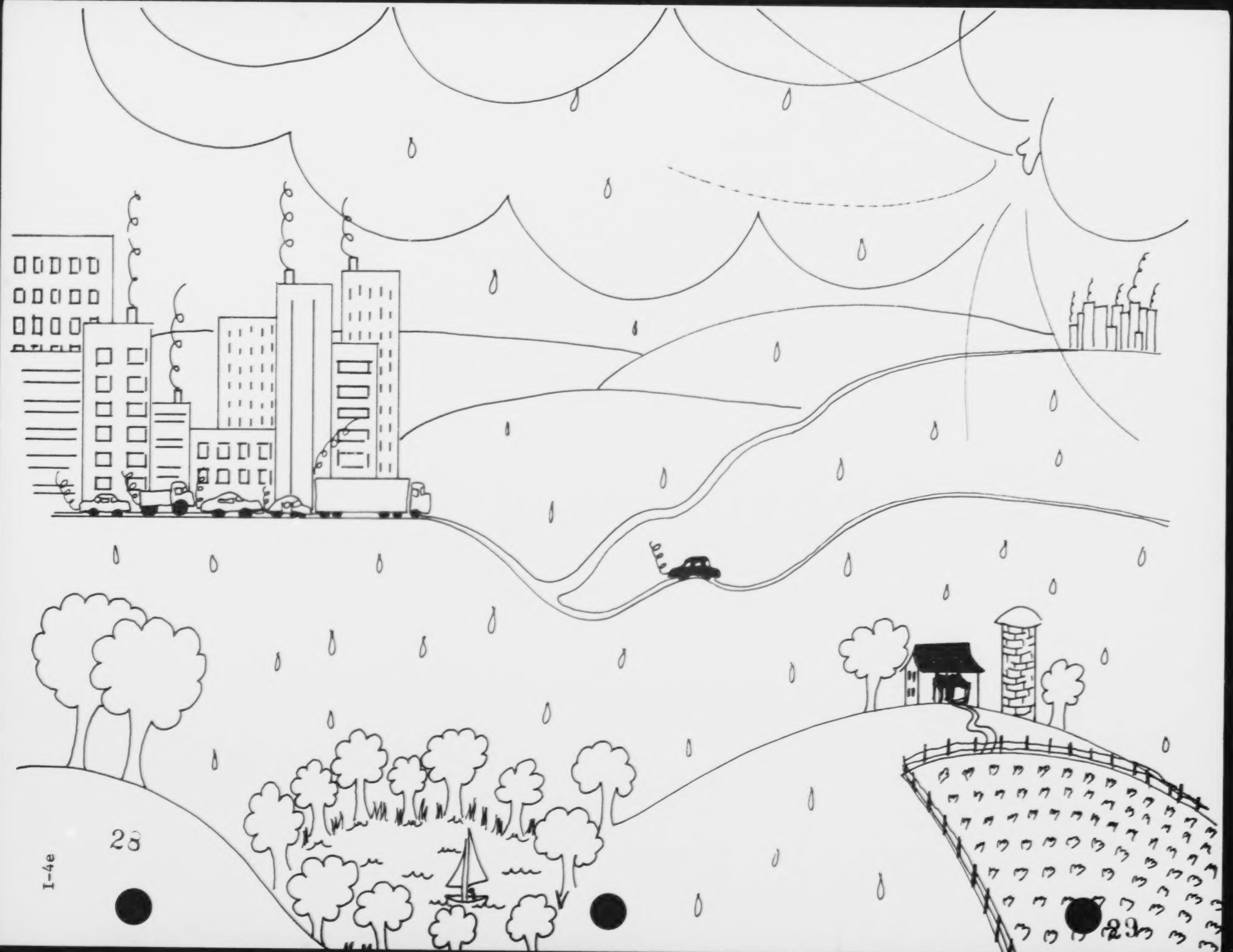
CLARKE
LUCAS
MONROE
WAPELLO
JEFFERSON
HENRY
DES MOINES
FREMONT
PAGE
TAYLOR
RINGGOLD
DECATUR
WAYNE
APPANOOSE
DAVIS
VAN BUREN
LEE
● Strip Mines
□ Underground Mines

WHAT'S ON YOUR *MIND*

What do *YOU* think about coal mining ??


doctor
naturalist
you
citizen living close to a power plant using coal
native American
miner
deer, squirrel, "wild life"
teacher
machine operator


I-4e
28
23

TITLE Petroleum Pets

SUBJECT Science, Art **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students will find their way through a maze and discover things along the way which are made of petroleum. They will make "petroleum pets".

OBJECTIVE

Students will be able to tell how crucial petroleum is in their daily living.

MATERIALS	TIME
handouts 15a, 15b, 15c	Awareness - 15 to 30 min.
items from Home	Concept Development 30 - 60 minutes.
paper plates	Application - Variable
fasteners	

LEARNING CYCLE

AWARENESS - The students will follow the maze (see 5a). Then they will turn the paper over and write down all the items they can from memory. They will discover that petroleum is the common ingredient in each of those items.

CONCEPT DEVELOPMENT - Students make individual lists of all the items they use in their daily life made from petroleum. The 12 most "important" ones are printed on the oil barrels with N or L, indicating necessity or luxury (see 5b). The oil-spin game can be played at this time (see 5c). Students can work in groups.

APPLICATION - The students are to make "petroleum pets" at home to be brought to the Petroleum Pet show on a designated day. The "pet" should be constructed using only petroleum products. Encourage the utilization of as many petroleum products as possible. They could be paraded around the other classrooms as an appeal for conservation to petroleum-made products.

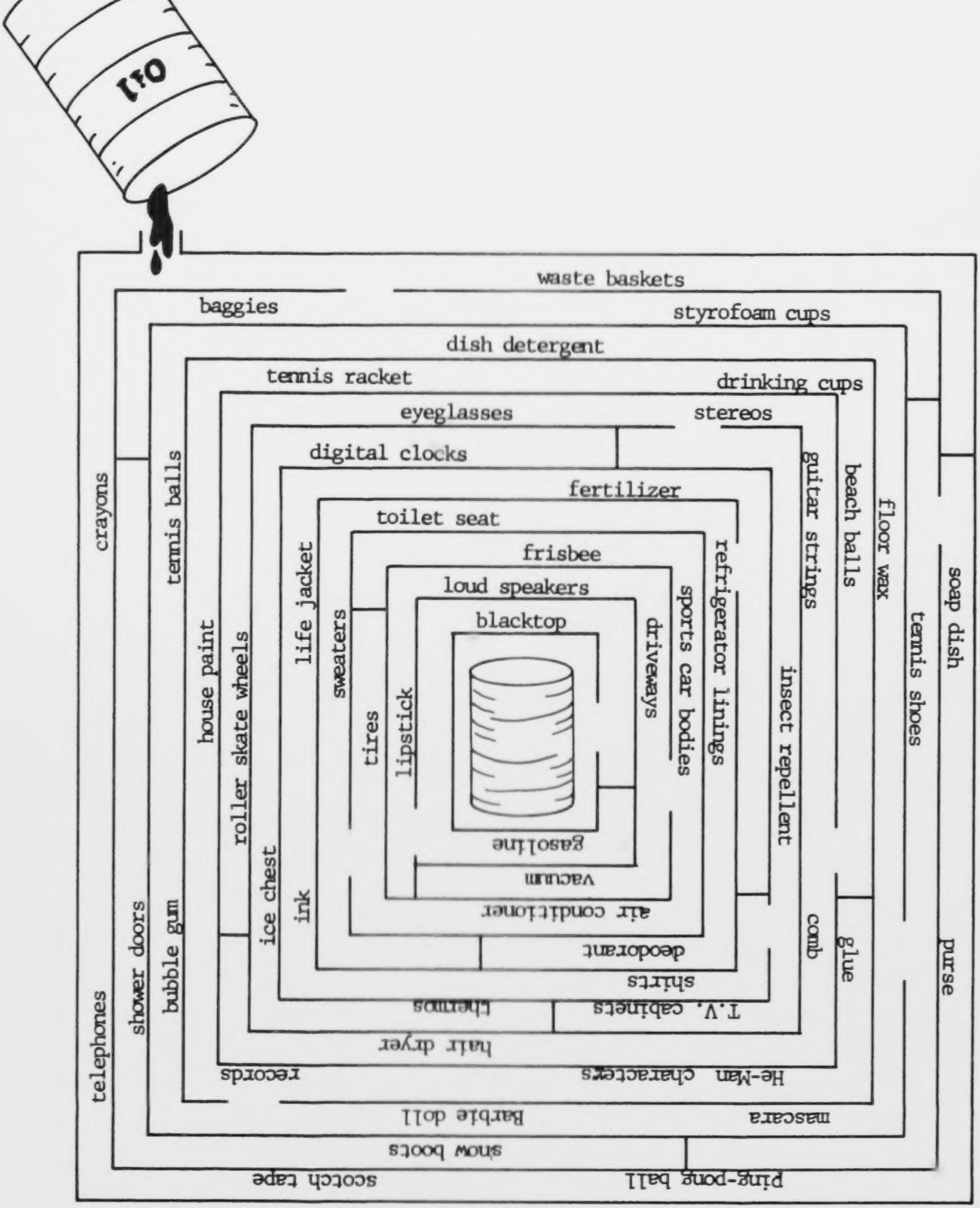
FOLLOW-UP/BACKGROUND INFORMATION

The teacher may wish to let the children explore the different qualities of the various petroleum products. The burning qualities of petroleum based products can be demonstrated by the teacher (see 5d) with the students recording some results. Teacher guidance and supervision is advised if students are allowed to work with fire. Toxic fumes can be emitted during the burning of certain materials. (This is why burning of plastic and styrofoam products should be discouraged.)

SOURCE OF ACTIVITY

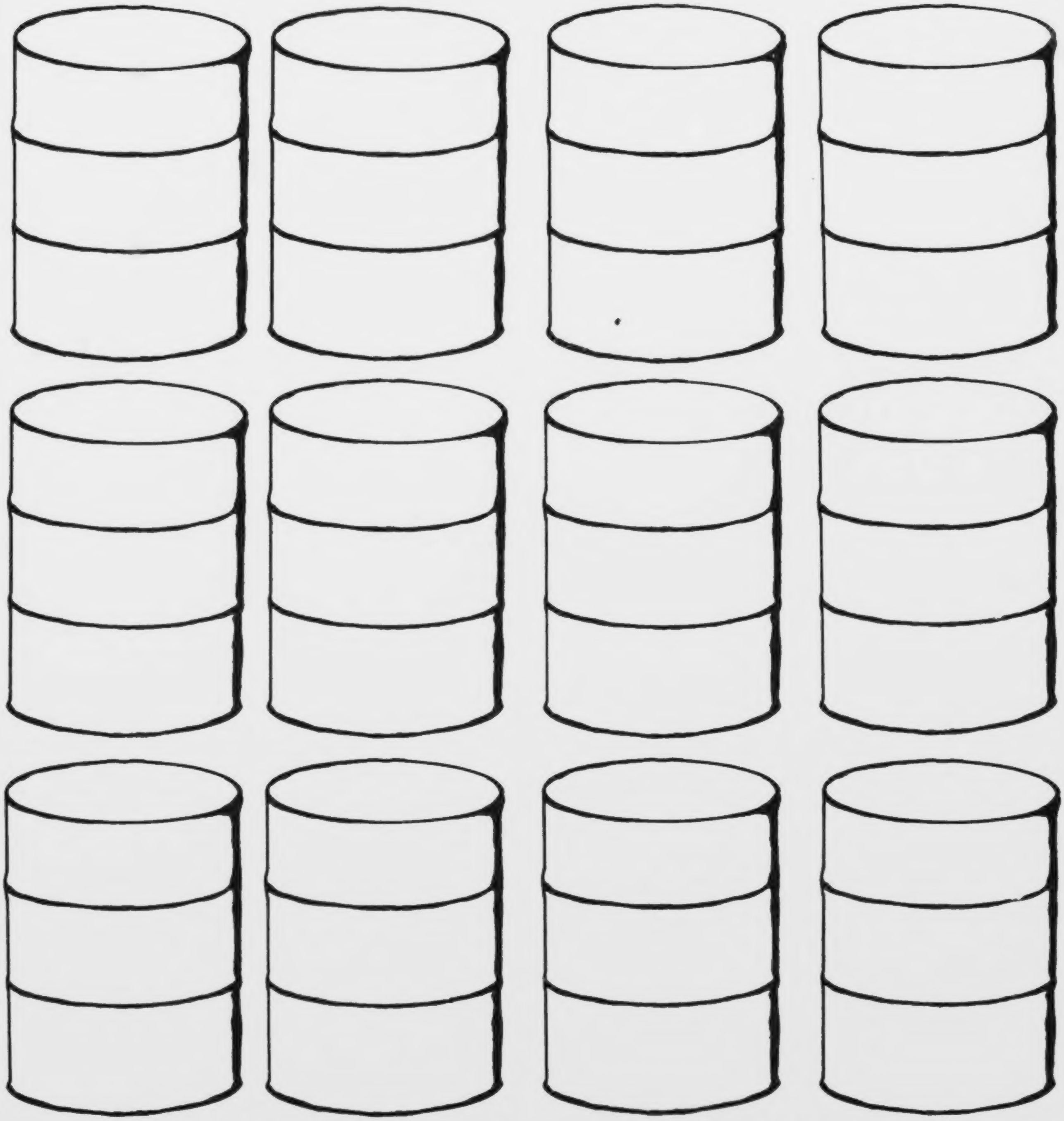
ECAPS,

OIL A-MAZE-MENT


Oil
waste baskets
baggies
styrofoam cups
dish detergent
tennis racket
drinking cups
eyeglasses
stereos
digital clocks
fertilizer
toilet seat
frisbee
loud speakers
blacktop
crayons
tennis balls
house paint
roller skate wheels
life jacket
sweaters
tires
lipstick
driveways
sports car bodies
refrigerator linings
insect repellent
guitar strings
beach balls
floor wax
tennis shoes
soap dish
gasoline
vacuum
air conditioner
deodorant
shirts
T.V. cabinets
thermos
hair dryer
He-Man characters
records
mascara
Barbie doll
snow boots
ping-pong ball
scotch tape
telephones
shower doors
bubble gum
ice chest
ink
comb
glue
purse

I-5b

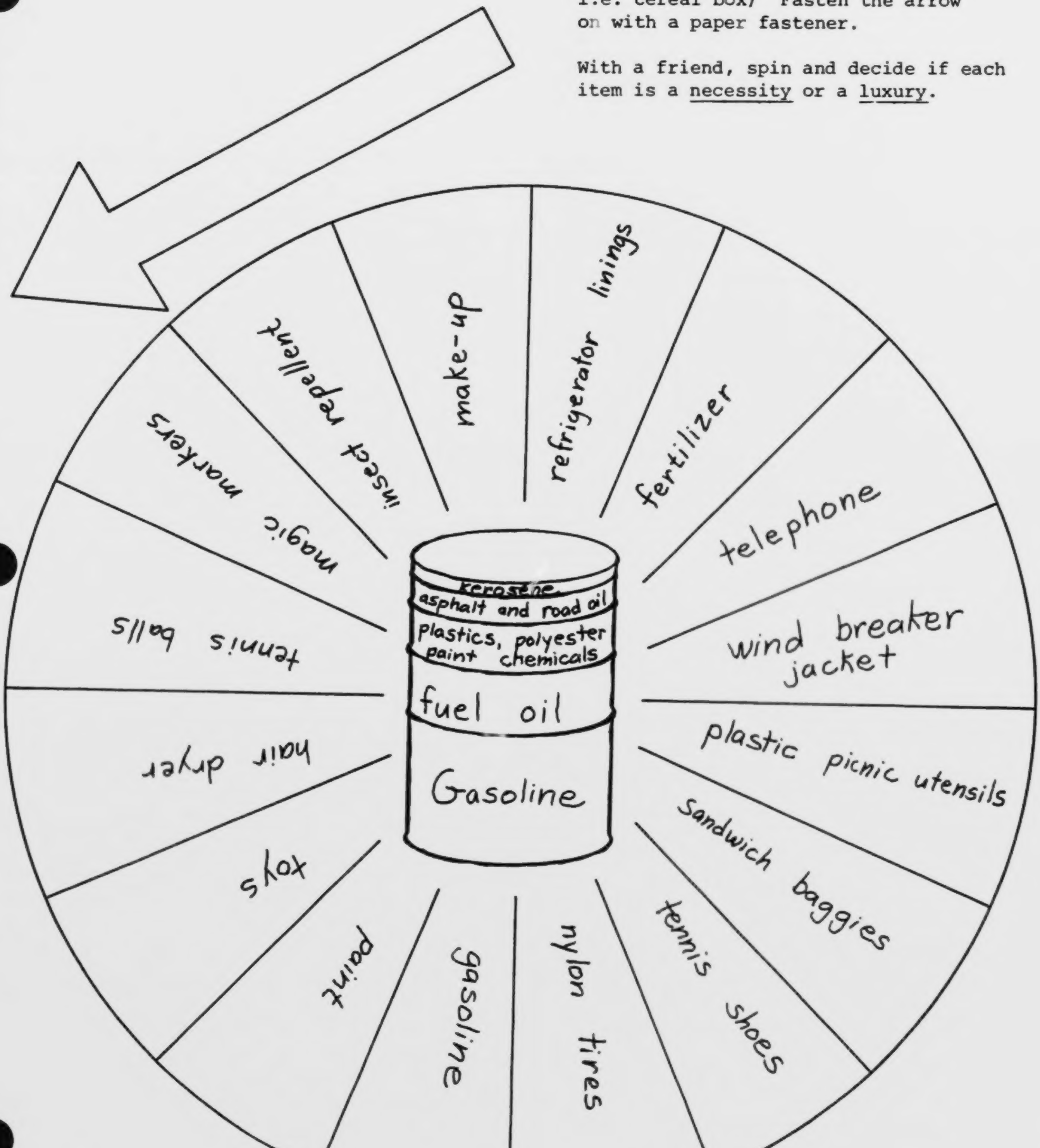
Petroleum - How much do you use?



Make a list of the things you use personally which are made of petroleum. Then number them in order of their importance to you. Write the name of your first 12 items on the oil barrels. Write "N" if the item is necessary for survival. Write "L" if the item is a luxury.

Make the spinner game by cutting out and gluing the wheel and arrow on a paper plate or a piece of cardboard. (Use a recycled box if possible, i.e. cereal box) Fasten the arrow on with a paper fastener.

With a friend, spin and decide if each item is a necessity or a luxury.


kerosene
asphalt and road oil
plastics, polyester
paint chemicals
fuel oil
Gasoline
make-up
refrigerator linings
fertilizer
telephone
wind breaker jacket
plastic picnic utensils
sandwich baggies
tennis shoes
nylon tires
gasoline
paint
toys
hair dryer
tennis balls
magic markers
insect repellent

PETROLEUM PRODUCT FLAME TEST

	Derived from Oil	Derived From Oil	Derived from Oil	Derived from Oil
	POLYESTER	STYROFOAM	PLASTIC (Baggie)	NYLON
Reaction to flame	Yellow flame, uneven, many little flames	Disintergrates rapidly; curls little flame until end; then flairs.	Melted, blackened when all melted, caught fire and burned like candle.	Melted-sticks to what it melts on.
Odor	Mild	Smells like fried mushrooms. Fumes are toxic.	Mild	Smells a little like wood smoke
Smoke given off	About as much as a cigarette, blacker	Heavy black smoke; little particles floating around.	A little white smoke.	White
Ash residue	Brittle and black	Black, hard, little, porous.	Brownish-thick, not hardened, black specks.	Hard, solid, black.

TITLE Petroleum Potpourri

SUBJECT Social Studies, Reading, Math **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students have a relay race which will help them to conceptualize the diminishing world reserves of petroleum.

OBJECTIVE

The students will describe how petroleum is being consumed daily which leads to dwindling world reserves.

MATERIALS

a pail of water marked
"world's petroleum reserves",
preferable a small clear glass
aquarium for visual effects
one dipping cup variable
variable size dipping cups

TIME

Awareness - 30 to 45 min.
Concept Development - 30 min.
Application - 2 or 3 class sessions(45-60 min. each)

LEARNING CYCLE

AWARENESS - The student should have a basic understanding of petroleum based products before attempting this activity. [activity 4 is a good prerequisite to this activity] Each student is given a copy of the story "Pete and Petroleum".(see 6a) The students underline each item or activity in the story which somehow relies on petroleum. (ex: underline alarm [clock] because the clock probably is made of plastic, a petroleum product.) One student reads aloud. Another student is designated as the dipper, and the rest of the students follow the script, call out the word "dip" when a petroleum product is mentioned. Students are to underline the petroleum product. Discussion may follow regarding certain items considered petroleum products. The designated dipper in each instance dips out a cupful of "petroleum", and throws it away (down the drain) so that the students see petroleum consumption leading to diminished reserves.

I-6continued

CONCEPT DEVELOPMENT - The petroleum relay race is played. The students are divided into teams, each team representing a different country. The teacher sets a bucket of water at the front of the room to represent the world's supply of petroleum. The object of the game is for each "country" to collect as much petroleum as time permits, relay fashion. The teacher gives each team a collecting cup and a bucket to hold all the collected petroleum. On the "go" signal, a member from each team 1) runs to the petroleum pot, 2) dips out a cupful of petroleum, and 3) carries it back carefully (without spilling a single drop of this precious commodity). This process continues with each succeeding team member until the petroleum supply is depleted. The disequilibrating factor is that each country is given a different-sized cup:

U.S.A.	2-cup container	Mexico	1/4 cup container
France	2/3 cup container	China	1 Tablespoon
U.S.S.R.	1/2 cup container	Kenya	1 thimble

[Each cup represents the proportional amount of petroleum consumed by that country.]

The students then discuss possible reasons why the USA consumes so much more energy (petroleum) than the other countries. They make a list of ways Americans use petroleum.

APPLICATION - Students read or interview someone knowledgeable about lifestyles in other countries. Comparisons of lifestyles are made. Implications are made as to how Americans could conserve petroleum if they were to assimulate some of the customs, habits, and values of those other countries. What alternatives to petroleum-based products are there? What actions could Americans take to conserve petroleum?

FOLLOW-UP/BACKGROUND INFORMATION

The U.S.A. represents 6% of the population and consumes 34% of the world's energy.

The U.S.A. consumes:

2 1/2 times as much energy as the USSR
3 times as much energy as France
4 times as much energy as Japan
10 times as much energy as Mexico
23 times as much energy as China
100 times as much energy as Kenya

Another way to show this is to hand out peanut M & M's in clear plastic glasses, so that students can see concrete examples of energy consumption among the continents of the world. Students could represent the population of the various continents. The world consumes 80 quadrillion btu's of energy annually. We can state this as 80 quads, and each M & M may represent 1 quad for a total of 80 M & M's. The class is divided proportionately allocating student numbers by continent population.

Country	Population	NRG Alloc. of M & M's
North America	8%	39% - 32 M & M's
South America	6%	8% - 6 M & M's
Africa	10.5%	8% - 6 M & M's
Asia	61%	18% - 14 M & M's
Europe	14%	24% - 20 M & M's
Australia/oceanic	.5%	3% - 2 M & M's

SOURCE OF ACTIVITY

Duane Toomsen

Name_______________

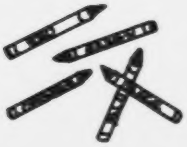
The day Pete had been waiting for had finally come! He jumped out of bed as soon as his alarm went off. The cold floor on his feet sent Pete to the thermostat. Ah! There! He heard the furnace click on. Now for a nice hot bath. He needed to listen for the weather report, so he turned on the T.V. for the early morning report. A little music from KMZT radio was next. As he lay back in the hot water, Pete dreamed of the trophy he hoped to win. He made a place for it in his mind on the shelf over his stereo components. But he lad lots to do yet before he would win that race! He wanted to look his best so he must shave and blow comb his hair. Where were his disposable razors? Oh, yes! They were still in the plastic bag in the car....along with his shaving cream. Over the air came the report...the weather sounded great! Pete remembered he had to pack a lunch for two. He got out the package of bread, the sandwich bags, and the package of bologna, a couple of styrofoam cups and the thermos for hot chocolate. Into the microwave went a cup for now. As he brushed his teeth, put on his deodorant and cologne, and combed his hair, he planned his agenda. He had to put on his new vinyl seat covers and floor mats in his car. He needed to check the oil and fill up before picking up Joe. He would use the phone at the station as his tires were being checked to call Joe to remind him to put new film in his camera. Pete put on his wind-breaker over his good luck shirt. His sunglasses and goggles were on his hat and on with his blue-striped tennis shoes. He was on his way..he knew it would be a winning day!

List all the petroleum products from the story.

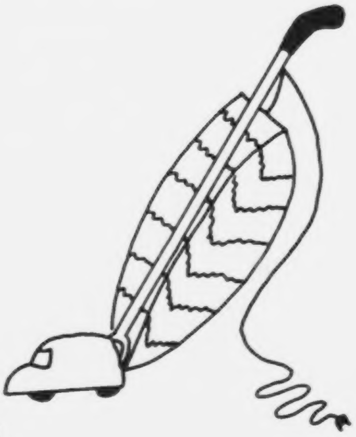
I-6b

Petroleum Products

Ink
Heart valves
Parachutes
Stretch pants
Telephones
Brassieres
Enamel
Transparent tape
Antiseptics
Vacuum bottles
Ping-pong paddles
Purses
Planters
Deodorant
Air conditioners
Crayons

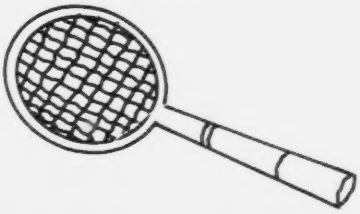


Dolls
Bubble gum
Floor polish
Sports car bodies
Tennis balls
Tires



Carpet sweepers
Shower doors
Soap dishes
Slip covers
Shoes
Volleyballs
Tobacco pouches
Refrigerator linings
Electrician's tape
Model cars
Folding doors
Floor wax
Mascara
Sweaters
Sneakers

Electric blankets
Tennis rackets



Drinking cups
Housepaint
Rollerskate wheels
Hair dryers
Guitar strings
Ammonia
Eyeglasses

Digital clocks
Life jackets
TV cabinets
Car battery cases
Insect repellent
Ice buckets
Fertilizers
Hair coloring
Toilet seats
Denture adhesive
Frisbees
Loudspeakers

TITLE The Petroleum Blues in the News

SUBJECT Language Arts LEVEL Intermediate

ACTIVITY IN BRIEF

Students write a news story about a disaster or dilemma regarding petroleum usage (spill, pollution, destroying of environment, diminishing supplies, etc.)

OBJECTIVE

Students will state some disadvantages of petroleum consumption

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MATERIALS	TIME
handouts (7a)	Awareness - 15 minutes
tape recorder	Concept Development - 45 to 60 min.
cassette video recorder (optional)	Applications - 2-3 sessions of 45-60 minutes each.
newspapers	

LEARNING CYCLE

AWARENESS - The students will study and discuss the "Bad News" pictures. (see 7a) Then the statements are matched with the pictures.

CONCEPT DEVELOPMENT - After examining other news stories and reviewing the basics of writing a news story, the students will compose a news story regarding petroleum and a crisis situation.

APPLICATION - Students produce a news broadcast either for radio or T.V. regarding a petroleum crisis situation. They divide into groups of four or five. These positions can be filled as follows: reporter, concerned citizen, eyewitnesses and persons responsible for the damage. Each member writes a statement. The reporter will make a list of questions to ask each representative. It is rehearsed before it is presented to the entire group.

FOLLOW-UP/BACKGROUND INFORMATION

The newsstory should have a "catchy" headline and the story should capture and hold the attention of the reader. Who-what-when-where-why-(how?) should be answered. Of course, the story will be fictitious, yet, real news of these happenings have made the news and will continue to do so. Students are encouraged to bring in these newsworthy stories.

SOURCE OF ACTIVITY

Adapted from Watt's Happening by Janey Swartz

Bad News-The Petroleum Blues

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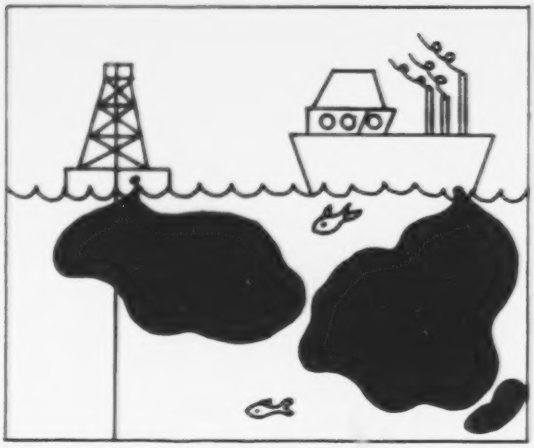

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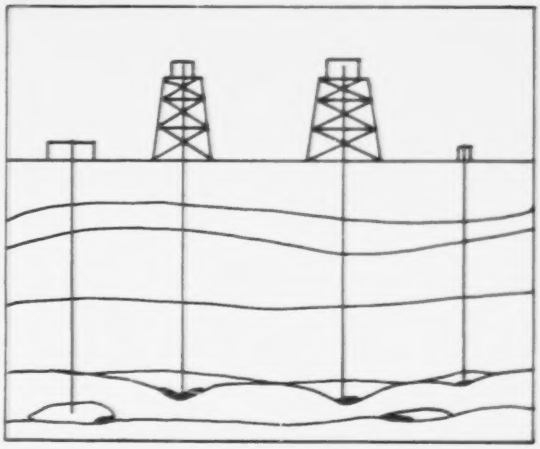

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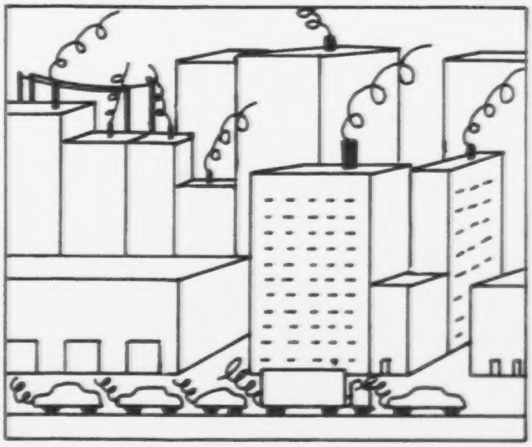

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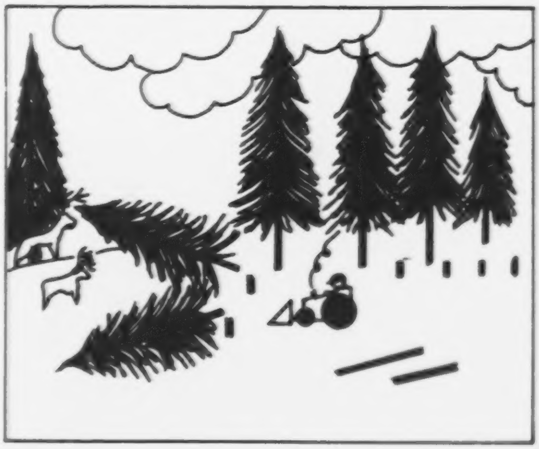


Match the statement with the picture.

1. Petroleum resources may be used up in just a few decades.
2. Burning petroleum or it's products causes pollution.
3. Sometimes spills occur whereby petroleum is spilled into the ocean or onto shorelines from off-shore wells or oil tankers.
4. Pipelines must sometimes be built across long distances, including undisturbed natural areas, to transport oil from oil fields.

TITLE Operation Pipeline!

SUBJECT Science, Art
Creative Dramatics

LEVEL Intermediate

ACTIVITY IN BRIEF

Students will act out the sequence of events dealing with natural gas(from drilling site to the home.)

OBJECTIVE

The students will describe the sequence of events from natural gas production to the delivery to the power plant and the home. They will tell where and how their community gets its natural gas. Effects on the environment will be considered.

MATERIALS

handouts 8a
8b(optional)

TIME

Awareness - 30 minutes
Concept development - 15 to 30 minutes
Application - One session - variable

LEARNING CYCLE

AWARENESS - The students "become" the various components of the natural gas distributing system. Two children form the drilling rig, four or five more join hands to become the pipe line, carrying natural gas to the power plant. Four children become the trees in the forest which need to be chopped down so the pipeline can go through. The three children forming the power plant make electricity using the natural gas as fuel. Four more children become electric lines "zapping" electrical current to the house (2 or more children). One child becomes the radio in the house, another becomes the pot of water. The teacher directs the floor plan. The students pose as the various components. They also create the sound effects. The teacher will establish the order of events from drill site to the teakettle. When the pot of water boils and the radio broadcasts a weather report, the chain of events has been completed.

1. Drilling rig	2 students	hold hands and pump up and down - making pumping sucking sounds
2. Pipe line	4-5 students	connect hands - "swish swish" sound
3. Trees	4 students	outstretch and connect arms (fall when "chopped down" for the pipelines to come through)
4. Power plant	3-5 students	make electricity (turbines could spin around)
5. Electric wires	4 students	connect hands and "zap-zap" electrical current
6. Pot of water	1 student	boils and makes "bubble-bubble" sounds when the electricity reaches it.
7. Radio	1 student	broadcasts a weather report when the electricity arrives

CONCEPT DEVELOPMENT - The students color and verbalize the chain of events from drilling rig to radio. Notice there is a direct pipeline to the house for the gas stove and furnace. (The teacher should point out the fact that some stoves and furnaces use natural gas.)

APPLICATION - A resource person from the utility company is invited to talk about the community's source of natural gas, location of pipe lines, construction of pipelines, etc. Maps would be helpful to show natural gas sources and pipelines.

FOLLOW-UP/BACKGROUND INFORMATION

Natural gas is not the same as gasoline. It is a gas formed by the natural decomposition (mostly by bacteria) of animal tissue and plant fiber. This decomposition took place millions of years ago (although it is still taking place today) and the gas has been trapped underground since then. We are using the natural gas a million times faster than it is being produced by natural processes today.

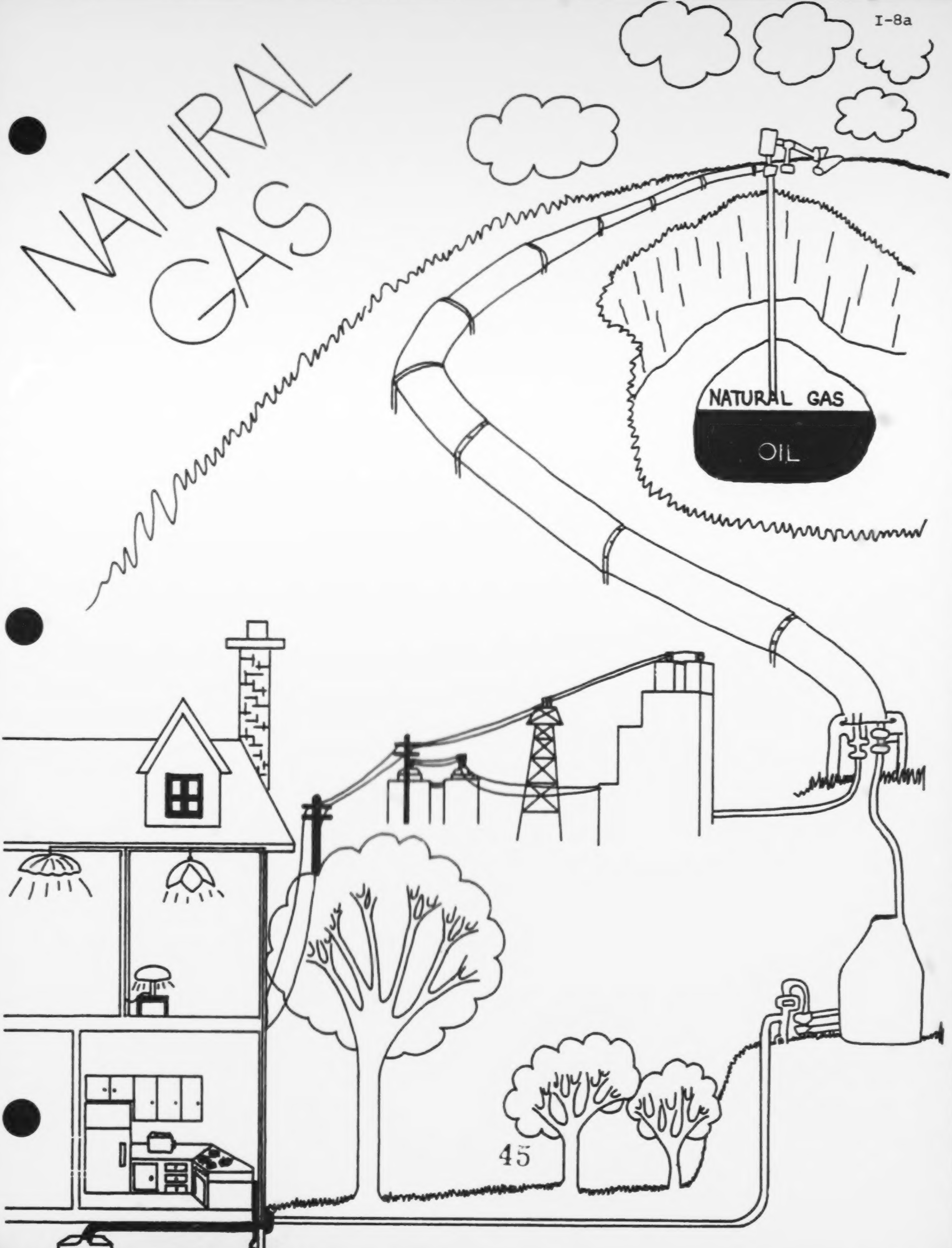
Many power plants burn natural gas for electricity production. It is a clean-burning, efficient fuel. However, supplies are limited. Some say that there is only enough to last 20-35 years at our present rate of consumption.

Of the total energy used in homes, 70% is used for heating and cooling the home. 20% is used to heat water and 10% is for other electrical needs (cooking, lights, small appliances, etc.) So, if we conserve energy in these areas, we will be conserving natural gas.

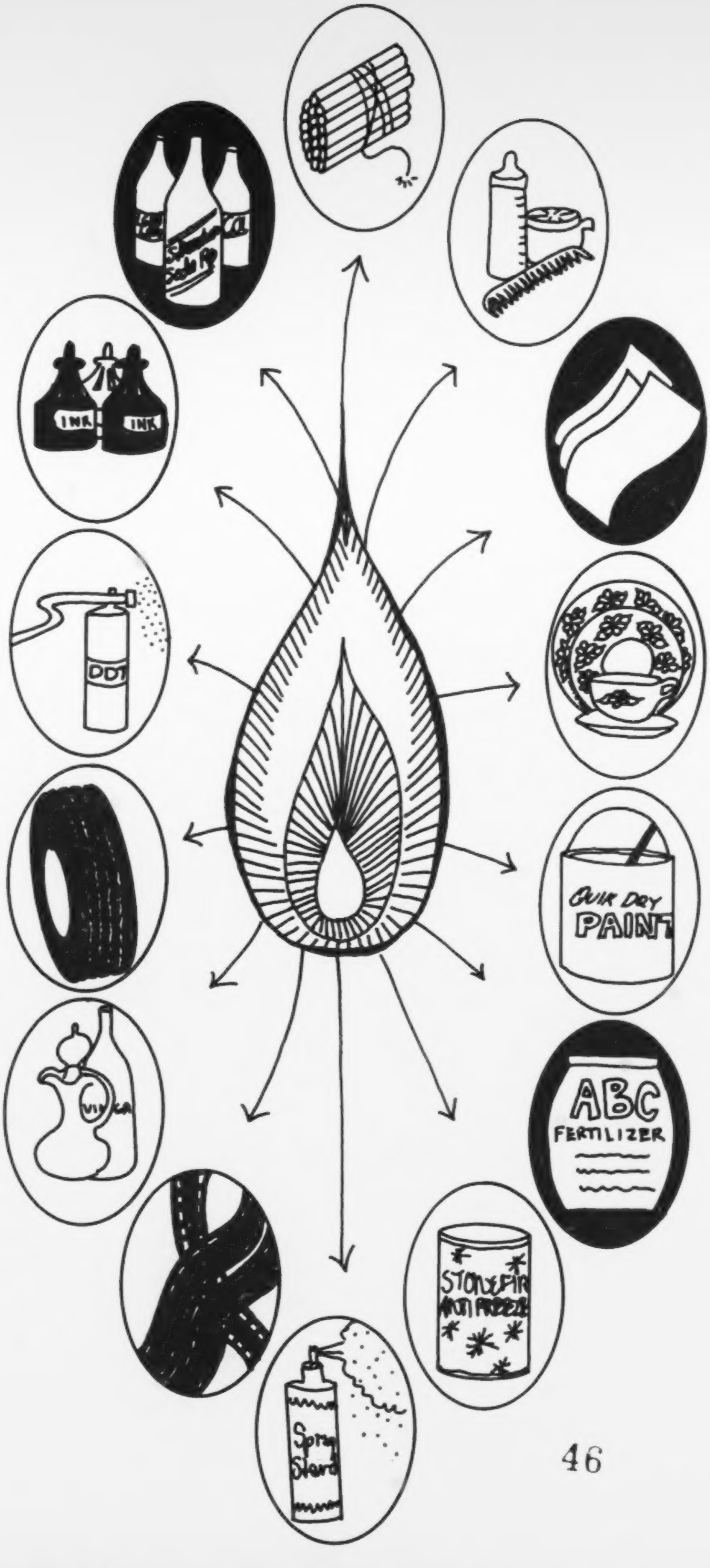
See 8b for more natural gas products.

SOURCE OF ACTIVITY

Janey Swartz


NATURAL GAS
NATURAL GAS
OIL

I-8b


INK
INK
DDT
VIN GA
QUIK DRY PAINT
ABC FERTILIZER
STONEFIR ANTI FREEZE
Spray Starch

TITLE It's A Gas!

SUBJECT Math **LEVEL** Intermediate

ACTIVITY IN BRIEF

The students gather information regarding their family's transportation needs and gasoline expenditures. They write story problems using their information.

OBJECTIVE

The students will be able to organize data pertaining to their family's transportation expenses. They also state ways they and/or their family can reduce gasoline consumption.

MATERIALS	**TIME**
handouts - I-9a, I-9b, I-9c	awareness - one week survey at home concept development - 30-60 minutes application - 2 sessions 30-45 min. each

LEARNING CYCLE

AWARENESS - The student takes home the Transportation Data Sheet to be filled out with the family. After all the information is gathered, the student makes an "I learned" statement. (See I-9a)

CONCEPT DEVELOPMENT - The student develops a story problem using data collected in awareness activity. It is written on a 3x5 card. Three or four answers to choose from are put on the back. Problems are exchanged and worked by other class members.

APPLICATION - The students think of ways to save gasoline. Each idea is written on a gasoline can. (See I-9b) The student then uses one of the ideas as inspiration for a song. The words are set to a familiar tune such as "The More We Get Together." Write the words on the record. (See I-9c)

FOLLOW-UP/BACKGROUND INFORMATION

26% of all energy consumed in Iowa (and in the USA) is for transportation. Transportation accounts for 13% of all consumer spending. 300 million gallons of gasoline are used in U.S. automobiles every day.

Carpooling saves gasoline! If we raise the national average to 2 people riding in each car, the nation could save 5 billion gallons of gas each year.

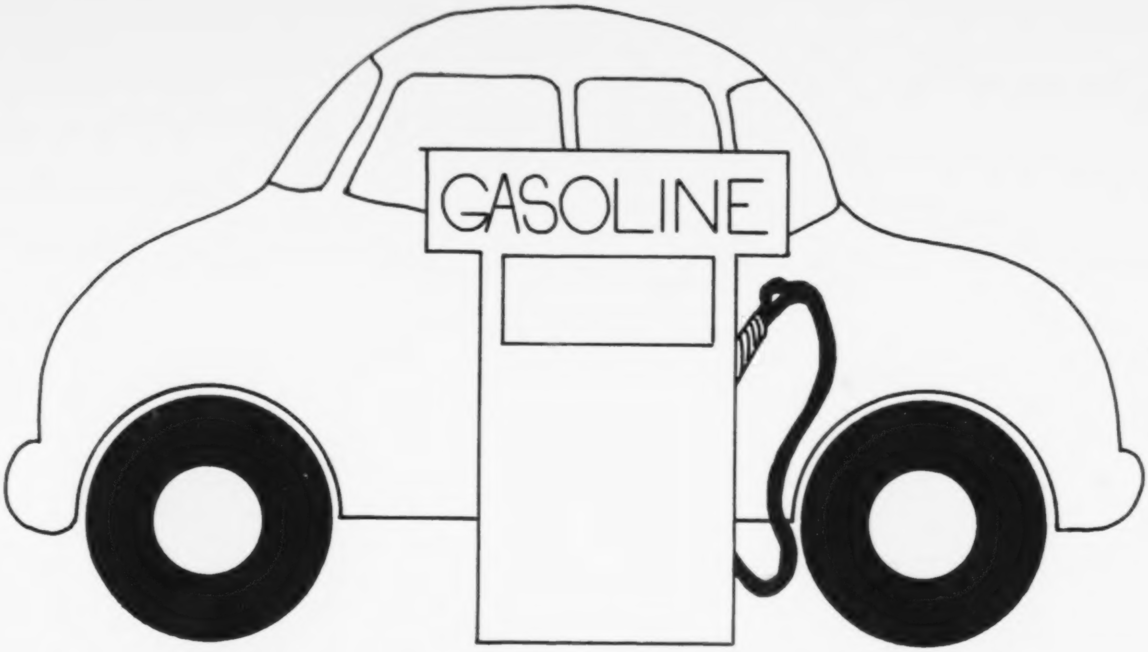
Keeping cars in tuned and good running order could reduce an individual's gas consumption by 10%. Combining and planning trips saves gasoline. Riding a bike or walking whenever possible is healthy exercise and saves gas. Taking public transportation whenever possible and turning off the engine while waiting (such as at a fast food drive-up window) saves gas. Idling the engine wastes gasoline.

The students could write a story entitled, "How My Family Will Survive on 5 Gallons of Gas a Week."

SOURCE OF ACTIVITY Janey Swartz

It's A Gas

Name____________________ I-9a



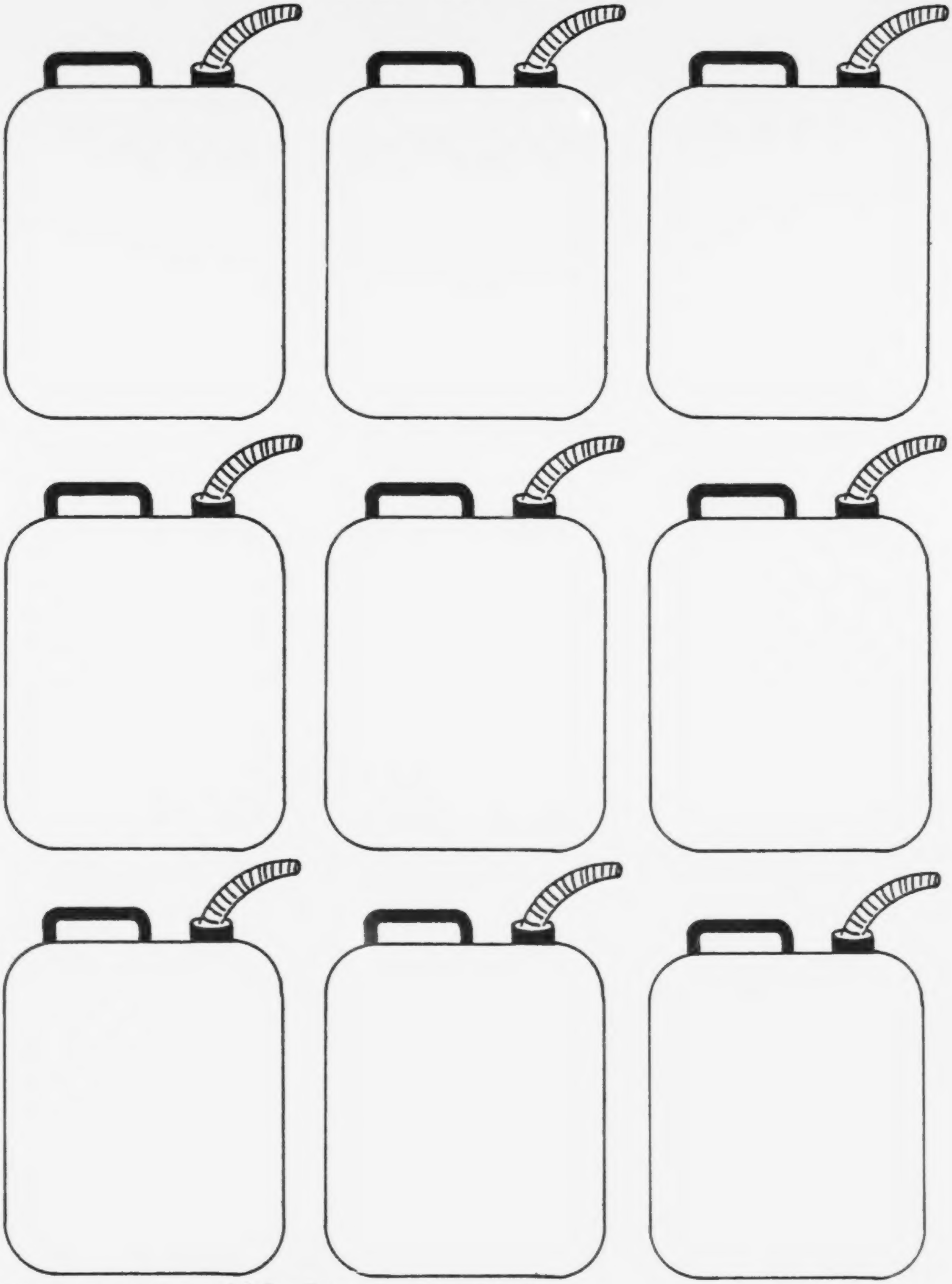
MON TUES WED THURS FRI SAT SUN

TOTAL MILES __________

My family car goes about _________ miles in a week.
It uses about __________ gallons in a week.
We spend about $__________ a week on gasoline.

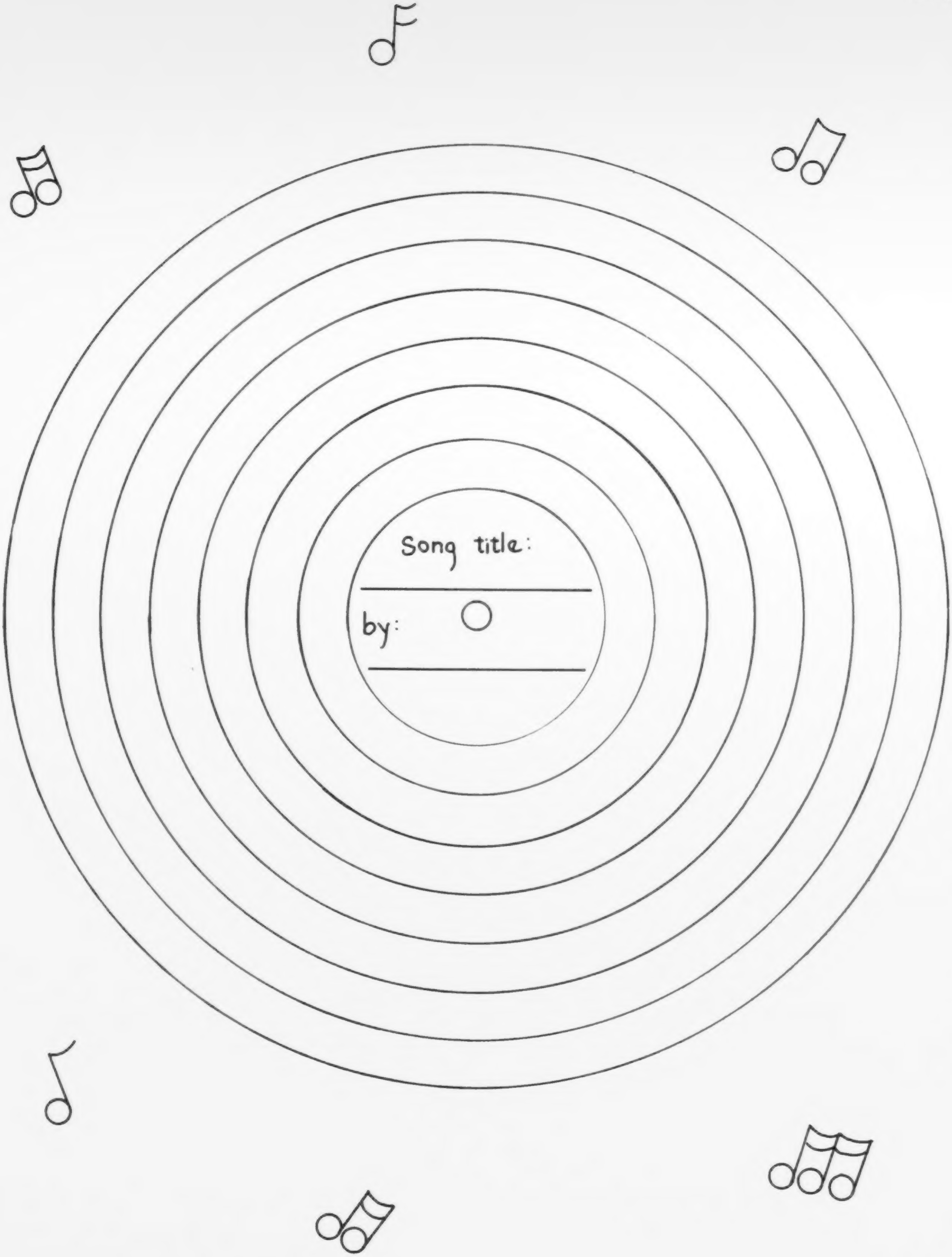
I learned that ______________________________

Its a Gas



How many ways can you think of to save gasoline?
Write each way on a can of gasoline.

Invent a song, poem, or slogan to share ways of saving gas.
Get a friend to help you share it with the class.


Song title:
by:

TITLE It's Fuelish

SUBJECT Social Studies, Math **LEVEL** Intermediate

ACTIVITY IN BRIEF

The students will gather data and graph information pertaining to transportation.

OBJECTIVE

The students will organize data in bar graph form. They will be able to state how we, as a nation, waste energy in our transportation.

MATERIALS	TIME
handouts I-10a, I-10b magazines, scissors, poster paper, glue, markers, etc.	three 30 minute sessions in a 3-day interval concept development - 45-60 min. application - 1-2 hrs.

LEARNING CYCLE

AWARENESS - The students collect data at a heavily traveled intersection for three days at varying times. They simply record the type of vehicle (car, truck, bus, or motorcycle) and the number of passengers in each vehicle.

CONCEPT DEVELOPMENT - The teacher makes a sample graph on the blackboard of the various modes of the typical transportation methods used by the students. The students learn how to find the average number of passengers per car. They then graph their own traffic and survey data and calculate the average number of passengers per vehicle. (See 10a)

APPLICATION - Students discuss transportation habits, reasons for using each particular mode of transportation, and energy consumption comparisons of each transportation form used. A collage of transportation modes will be created. The students will cut pictures from magazines to show the needs, preferences, and choices, of our society regarding transportation.

FOLLOW-UP INFORMATION

The students could take part in a low fuel day. They would not use any (or limited amounts of) gasoline or fuel to get where they are going. Low energy transportation modes would be used, such as walking, biking, skating, etc. For every block walked, bicycled, etc., the student would receive an "I-Saved-Gas-Buck" (see background). The one who collected the most could win a prize such as a pass to the skating rink, a bicycle decal, neon shoe laces, etc. or the fuel-saver winner could become Mr. or Ms. Energy gaining privileges and favors throughout the day.

BACKGROUND

The students need to be aware of the convenience aspect of owning and operating a car. We drive here and there often without thinking of the effect this luxury has on the world's petroleum reserves. There are many ways to cut down on gasoline consumption. Cutting down on "unnecessary" trips would be one way to do so. Carpooling whenever possible saves gasoline as well. If people could ask themselves, "Is this trip really necessary or is it simply a luxury?" and then arrange to drive only those trips deemed necessary, a good conservation ethic would be established.

The "I-Saved-Gas-Buck" could be designed by students and run off in mass by the teacher.

Students need to be aware of the effect of automobile exhaust on the environment. Acid rain is a very serious and imposing problem due to the contributing effects of automobile exhaust. The students could color and discuss the picture dealing with acid rain. (See I-4e)

SOURCE OF ACTIVITY

Janey Swartz

Traffic Survey

I-10a

Day #_____ Time _______

14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
	car	truck	bus	motor cycle	bike

Average number of:

passengers per car_________
passengers per truck _________
passengers per bus _________
passengers per motorcycle _______
passenger per bike _________

Day #_____ Time _______

14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
	car	truck	bus	motor cycle	bike

Average number of:

passengers per car_________
passengers per truck _________
passengers per bus _________
passengers per motorcycle _______
passenger per bike _________

Day #_____ Time _______

14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
	car	truck	bus	motor cycle	bike

Average number of:

passengers per car_________
passengers per truck _________
passengers per bus _________
passengers per motorcycle _______
passenger per bike _________

Day #_____ Time _______

14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
	car	truck	bus	motor cycle	bike

Average number of:

passengers per car_________
passengers per truck _________
passengers per bus _________
passengers per motorcycle _______
passenger per bike _________

TITLE Turn That Turbine

SUBJECT Language Arts, Writing **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students observe how electricity is produced (using a galvanometer and magnet). They study a diagram and/or model and tell the sequence of electricity production. They write a sequence of electricity production. Students create a model using renewable energy sources.

OBJECTIVE

Students will be able to tell the sequence of electricity production. They will be able to name alternatives to using non-renewable energy sources.

MATERIALS	TIME
magnet and galvanometer (optional)	awareness - 30-45 minutes
items to make a turbine (optional)	concept development - 45 minutes
handouts - I-11a, I-11b	application - 60 min. to 1 1/2 hour

LEARNING CYCLE

AWARENESS - Students observe electricity being produced with a galvanometer and a magnet (one could be obtained from the high school science department). The teacher explains how huge magnets in power plants must be turned to produce electricity to service our homes. The diagram is shown to the student. The student will label the parts and the sentences will be numbered in order of sequence. (See I-11a)

CONCEPT DEVELOPMENT - Students will write and illustrate a book (a take-off of The House That Jack Built). Example:

> This is the light that Jack turns on.
> This is the socket for the light that Jack turns on.
> These are the power lines to the socket for the light that Jack turns on.

APPLICATION - Students consider energy sources (other than fossil fuels) to make the turbines spin. The students draw up plans using one of these energy sources: solar, wind, ocean tides, moving water, biomass, geothermal, and of course, nuclear fission. The main question is: How do we get the water hot enough to produce steam to turn the turbines? Or how do we otherwise turn the turbines? (See I-11b) The student will then write a story from the viewpoint of the energy source consisting of "My Good Points" and "My Bad Points."

FOLLOW-UP/BACKGROUND INFORMATION

Solar energy is clean and renewable! It is one of our most promising future energy sources but it now it supplies only about 1% of the energy used in the U.S. and in Iowa.

Wind, too, provides only about 1% of the energy used in the U.S. and in Iowa. Some scientists predict that by the year 2000, 10% of our energy needs could be supplied by wind, but the equipment needed will be costly. Wind is unpredictable so ways to store the energy need to be developed. Any wind over 8 m.p.h. can be used to generate electricity.

Ocean tides are among the most powerful forces on the earth. To harness the rising and falling of the tides would be an expensive process, but this could be a very important future energy source for the Eastern United States. Perhaps underwater windmills or floating generating stations could utilize this potential energy source to produce electricity.

Nuclear fission, the splitting of the atom, releases tremendous amounts of heat. The heat released can in turn produce electricity. (Heat boils water, which produces steam, which drives a turbine, which runs a generator, which produces electricity.) Fission provides 3.5% of the energy in the U.S. and 6.4% of the energy used in Iowa. Major problems exist however; safety concerns for disposing the radioactive waste products, the possibility of a meltdown, releasing dangerous radiation into the environment, the danger of theft of nuclear fuels, and dangers of radiation exposure to the workers in a nuclear power plant.

Energy can be obtained from "garbage," or biomass. As bacteria decomposes, organic wastes (such as manure, septic tank sludge, food scraps, pond-bottom muck, etc.) methane is produced. Methane is the same as natural gas from the ground. There are power plants in the U.S. which use methane derived from organic wastes (mainly manure). Some cities produce electricity by burning garbage in specially designed power plants.

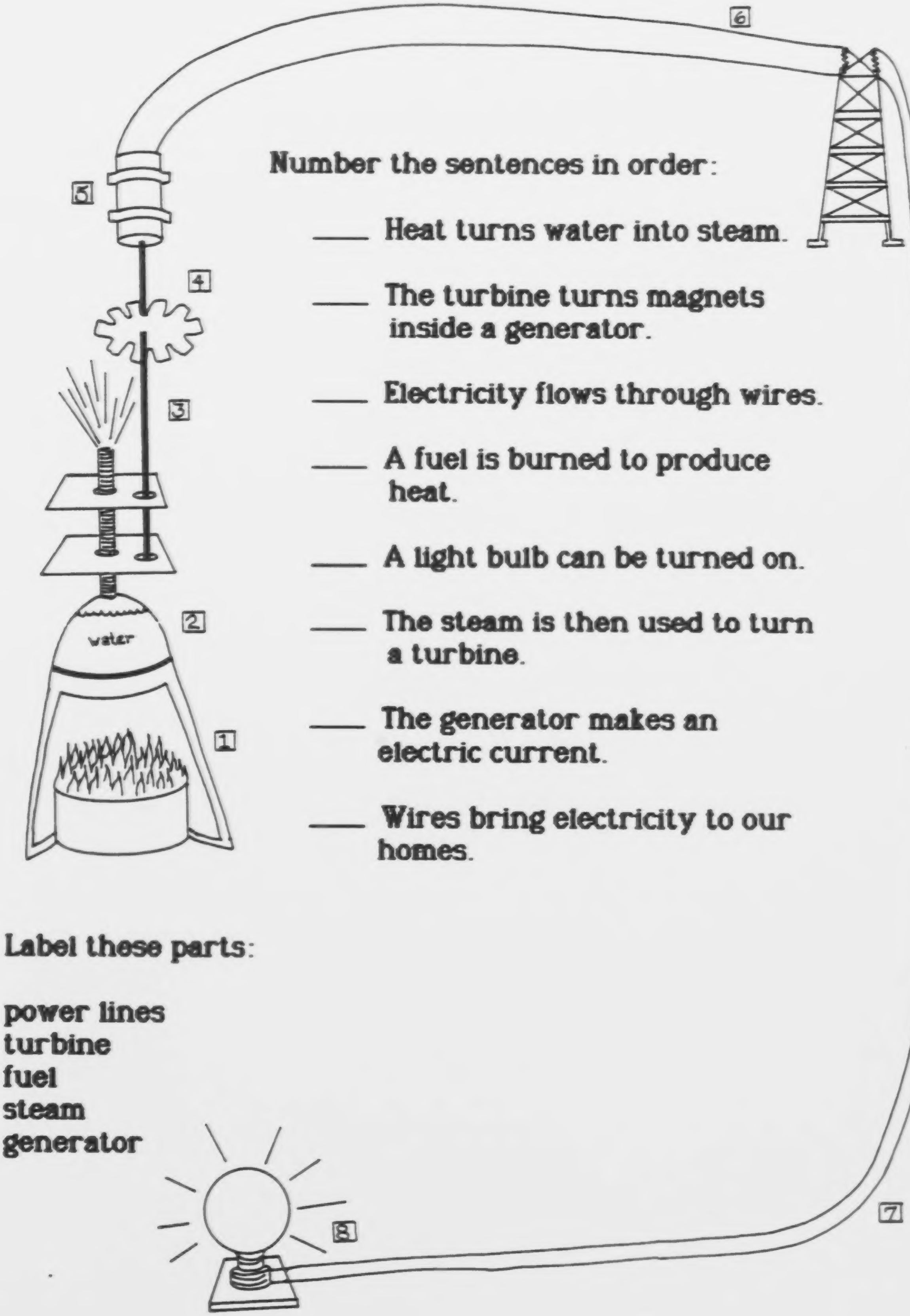
Nuclear fusion, is considered by some to be the alternative energy resource with the greatest potential for the future. Fusion is produced by combining the centers of two atoms. Fusion releases far greater energy than splitting the atom. Although fusion is a nuclear process, it has many advantages compared to nuclear fission. 1) meltdowns could not occur, 2) large quantities of radioactive shipments would not occur since hydrogen is the basic ingredient necessary, 3) the amount of radioactive waste would be much less, 4) danger of theft of nuclear fuels would not exist and 5) seawater, a nearly inexhaustible resource can be used. Scientists need to solve one major problem before we can use fusion for energy . . . how to create the extremely high temperatures necessary to fuse the atoms. (The temperature of the sun, where nuclear fusion occurs, is about 15 million degrees Centigrade at its center.)

Geothermal energy refers to the energy from the heat deep within the earth. The water and steam which gushes from a geyser could be used to turn a turbine, thus producing electricity.

Falling water (hydroelectric energy) provides 4% of the energy used in the U.S. and 2% of Iowa's energy. When water falls over dams, giant turbines spin and produce electricity. Hydroelectric power plants do not cause pollution, but problems do exist. There are fewer and fewer places left to build dams. When a dam is built on a river, environment issues occur, because lakes are created where land once stood.

SOURCE OF ACTIVITY

The Inventor's Workshop, adapted by Janey Swartz



Number the sentences in order:

___ Heat turns water into steam.

___ The turbine turns magnets inside a generator.

___ Electricity flows through wires.

___ A fuel is burned to produce heat.

___ A light bulb can be turned on.

___ The steam is then used to turn a turbine.

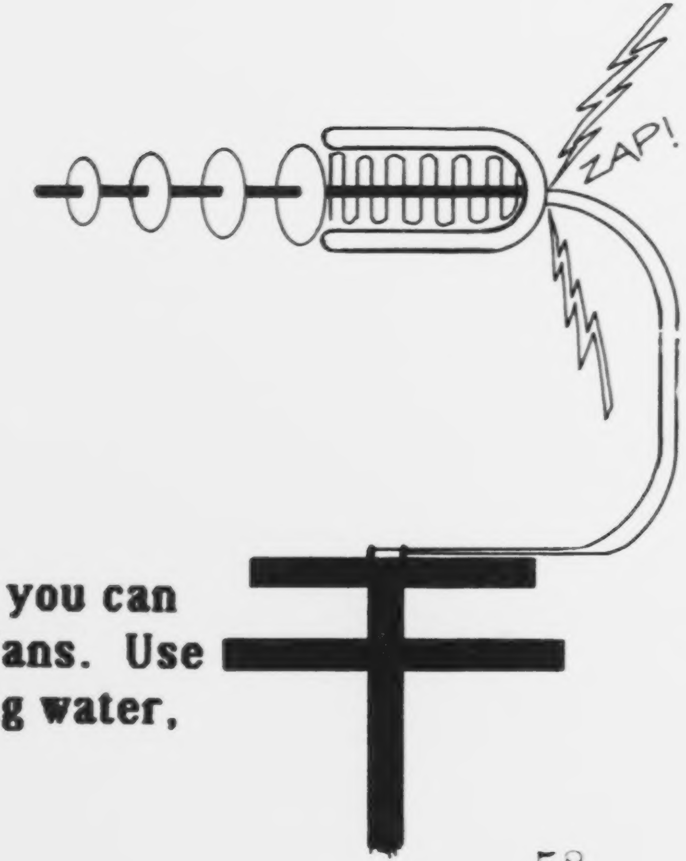
___ The generator makes an electric current.

___ Wires bring electricity to our homes.

Label these parts:

power lines
turbine
fuel
steam
generator

Turn that Turbine!



If you can get the turbine to spin, you can produce electricity. Draw your plans. Use solar, geothermal, nuclear, running water, biomass, or wind energy.

TITLE Buy Rights

SUBJECT Social Studies **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students buy rights with tokens throughout the day. Tokens illustrate energy distribution worldwide. Students become a world council working to solve a crisis energy situation.

OBJECTIVE

The students imitate the world community as they experience the unequal distribution of energy resources.

MATERIALS	TIME
handouts - I-12a, I-12b	awareness - 30 min.
chart of prices	concept development - ongoing all day
tokens (beans, pennies, chips, etc.) for exchange	application - 45-60 min.
crackers, Kool-aid/paper cups, stickers, sugarless gum, stuffed animals, plants, etc., to fill needs of the chart.	

LEARNING CYCLE

AWARENESS - The teacher outlines shapes of the major continents on the floor and divides the students in proportion to the percent of the world's population which resides on each continent. Each continent selects an energy czar, who will allocate however he/she decides to distribute energy tokens. Tokens are assigned to each continent in proportion to how much energy that continent consumes in a year:

Country	% of students (representing population)	% of tokens (representing energy consump.
North America	8%	39%
South America	6%	8%
Europe	14%	24%
Asia	61%	18%
Africa	10.5%	8%
Australia/Oceania	.5%	3%

The tokens "buy rights" throughout the day. (See I-12a) The teacher emphasizes the fact that the students are to keep their feelings in check. Toward the end of the school day, everyone will be given the opportunity to express their feelings about the activity. The teacher assigns someone to keep records, collect payments, and monitor requests. If 300 tokens are available, 117 would go to the North American energy czar. Assuming equal distribution was made, each of the two North Americans would have 57 or 58 tokens to spend. They could represent the USA and Canada. In contrast, each Asian would represent countries with far fewer tokens to spend.

CONCEPT DEVELOPMENT - Toward the end of the day, the students will have many feelings to express (mostly having to do with the unfairness of token distribution). The teacher guides the students' understanding of the unequal distribution of energy on a worldwide scale. The students finish "I learned..." statements. (See I-12b)

APPLICATION - The class becomes a world council made up of the various continents. Each "continent" elects a leaders. An emergency meeting is called because nonrenewable energy sources have reached crisis levels and the leaders must meet to decide how the remaining energy sources should be distributed. The members of the continent act as an advisory board. Each leader and board meet to discuss their distribution and their appeal for a share of the remaining resources. Each leader presents the plan to the world council. After the hearing, each student will write and read a statement to the council of how the crisis can best be resolved.

FOLLOW-UP/BACKGROUND INFORMATION

Environmental problems such as resource depletion, exist because much of the human world is dependent on source of energy which are in danger of running out. A worldwide ethic and commitment would promote harmony and balance and secure the future of our planet earth. The students need to be aware of the fact that they are a part of the total world scene and that their actions, great or small, effect the world energy picture. When an individual makes a commitment to live a lifestyle in harmony and balance with nature, that individual has recognized the importance of each persons' impact upon this planet.

SOURCE OF ACTIVITY

Janey Swartz

I-12a

A sample chart of arbitrary prices. (The teacher develops a chart for the class)

1 cracker	1 token
10 minutes of "free time" reading	5 tokens
a cup of Kool-aid	5 tokens
5 minutes of extra recess	5 tokens
use of the golden marker	1 token
sticker grab bag	10 tokens
a plant or stuffed animal to sit on your continent for 1 hour	10 tokens
time to listen to music on the head phones	3 tokens
time to tell a joke to the class	1 token
a walk down the hall for break	6 tokens
the right to chew gum in class	8 tokens
the right to pain a picture at the easel	5 tokens
a fun page to do	1 token

Be creative, and have the students add to the list.

I learned that ______________________________

I was surprised that ______________________________

I didn't know that ______________________________

I feel bad that ______________________________

I feel strongly about ______________________________

I think that ______________________________

I hope that ______________________________

I wish that ______________________________

I wonder ______________________________

TITLE Electrical Lifestyle

SUBJECT Social Studies **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students list their family's electrical appliances and prioritize them as to their importance and then they decide if the item is a luxury or a necessity. They think about their own lifestyles and consider some energy conserving actions they could take.

OBJECTIVE

The students examine the extent to which they use electricity in their daily life. They will be able to compare many different lifestyles contrasting the energy consumption pertaining to each.

MATERIALS	TIME
handouts - I-13a, I-13b, I-13c, I-13d	awareness - 30-45 minutes concept development - 45 minutes

---

LEARNING CYCLE

AWARENESS - The students review the items they own and use in their homes. (See I-13a) Then they write the names of electrical appliances they consider most important to them on the electrical outlets. (See I-13b) The families help may need to be solicited. An "N" for necessity and an "L" for luxury is lettered under each item.

CONCEPT DEVELOPMENT - The teacher calls on one student to name off the items on his/her list. If anyone else has any new items, those are added and so on until every student has his/her items appearing on the one class list. Each student is given a blank chart. (See I-13c) Each item is voted either a luxury or a necessity by a show of hands. The student then organizes a way to show the class's top 10 luxuries and top 10 necessities. (Charts, pictures, diagrams, etc.) The teacher may want to group the students for this project instead of having the students work individually.

APPLICATION - The student considers eliminating 3 luxury items and 2 necessities in order to conserve energy. A "fast" for a week is experienced and at the end of the week the student expresses his feelings about the new "lifestyle" experienced. The items which are eliminated for a week could be brought to school and placed on a table to symbolize the sacrifices being made by the students. What alternatives or substitutions were made? Would he/she be able to comfortably continue without these items?

FOLLOW-UP/BACKGROUND INFORMATION

The students hold an all school, no (or low) electricity day. Little or no electricity should be used. (Lights, duplicated materials, audiovisual equipment, bells, food preparation, etc., would all be affected. A sort of a return to "Little House on the Prairie" days would be enacted). Student may want to go a step farther and see how they can function without using electricity at home as well. (Toaster, oven, hair stylers, radio, T.V. lights, hot water, etc., would all have to be sacrificed). Obviously, the cooperation and support of the school administration and the family would be a necessity.

FOLLOW-UP/BACKGROUND/SOURCES

Modern living would be difficult without electrical energy. Many of the conveniences we enjoy today would be impossible without electricity. Of the total energy used in homes, 70% is used for heating and cooling, 20% is used for heating water and 10% is for lights, cooking and small appliances. Illustration "Can You Guess?" compares the energy consumption of some common household items. (See I-13d)

SOURCE OF ACTIVITY

Energy Conservation Activity Packet (ECAPs) "Can You Guess" activity by Sindy Stiles.

My Electrical Lifestyle

Check each item you have in your home. Double check items you use yourself.

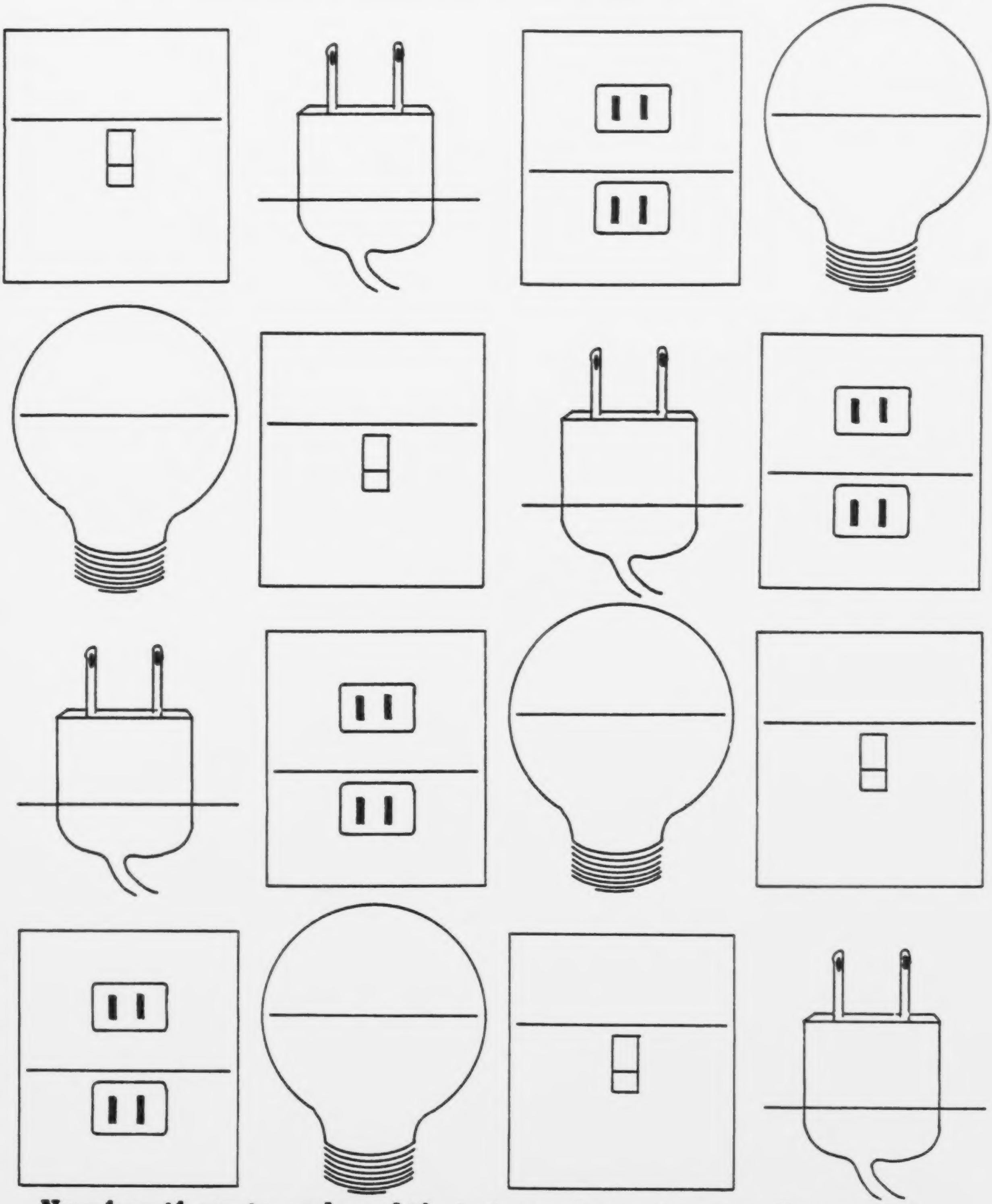
____air conditioner
____food blender
____dehumidifier
____humidifier
____dishwasher
____door bell
____back massager
____electric blanket
____can opener
____clock
____coffee maker
____slide projector
____iron
____electric saw
____drill sander
____television
____washing machine
____bun warmer
____floor polisher

____hair curler
____clothes dryer
____electric fan
____space heater
____lamps
____sandwich grill
____electric knife
____refrigerator
____tank filter
____aquarium
____hedge cutter
____electric typewiter
____home movie
____vacuum cleaner
____radio
____garage door
____warming tray
____water softener
____snow blower

____orange squeezer
____pencil sharpener
____electric stove
____waffle iron
____toaster
____musical instrument
____griddle
____frying pan
____electric oven
____electric shaver
____rug shampooer
____shoe polisher
____VCR
____movie projector
____tape recorder
____electric toothbrush
____electric mixer
____hair dryer
____record player

I-13b

Energy Eaters in my Home



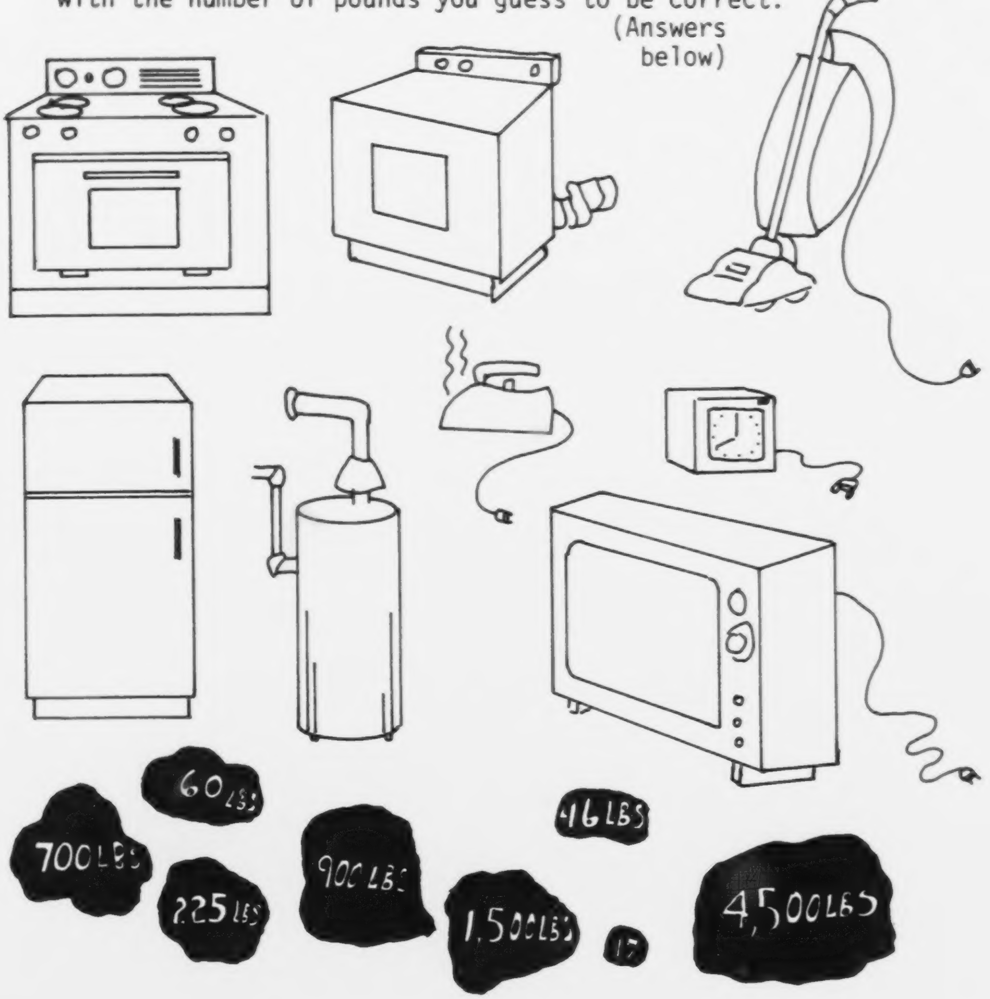
Number them in order of their importance to you. Put an "N" under each item which is necessary for living. Put an "L" under each item which you could live without (luxury).

LUXURY *or* *NECESSITY*

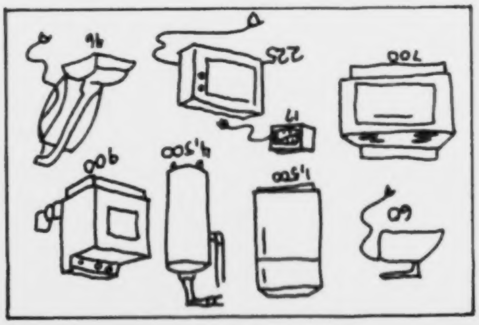
How many say "Yes, it is a luxury."		***NAME OF ITEM***	How many say "Yes, it is a necessity."	

CAN YOU GUESS?

HOW MANY POUNDS OF COAL ARE USED ANNUALLY TO PROVIDE ELECTRICITY TO OPERATE THESE APPLIANCES? (Draw a line from the appliance to the lump of coal with the number of pounds you guess to be correct!
(Answers below)


60 LBS
700 LBS
225 LBS
900 LBS
46 LBS
1,500 LBS
17
4,500 LBS

Answers


46
225
700
17
900
4,500
1,500
60

TITLE Electrical Spin-Off

SUBJECT Language Arts, Social Studies **LEVEL** Intermediate

ACTIVITY IN BRIEF

The students play a spin-the-arrow game and search for alternatives to using electricity. They produce a play about "A Day in the Life of a Pioneer" and compare lifestyles of yesteryear and today.

OBJECTIVE

The students will examine a simple lifestyle and organize information regarding a lifestyle of low energy consumption.

MATERIALS	TIME
handouts - I-14a, I-14b	awareness - 15-30 min.
cereal boxes and/or other cooking material	concept development - 2-3 sessions 45-60 minutes
fasteners	application - 1-2 hours

LEARNING CYCLE

AWARENESS - The students will assemble the Electrical Spin-Off Game (see I-14a) by cutting out the wheel and arrow and fastening them onto a piece of cardboard (preferably a piece of recycled packaging such as a cereal box). Students pair up and take turns spinning the wheel. The student describes or acts out a suitable alternative way of doing the activity without using electricity.

CONCEPT DEVELOPMENT - The students match the beginning and ending sentence parts ("What did they do then?") (See I-14b) Then they divide into groups and produce a play using the activities completed in the "What did they do then?" worksheet. Perhaps one group, for comparison, could take the same plot and rewrite it for modern day living.

APPLICATION - Make a poem, bumper sticker, song, poster, or flyer to explain how electricity could be conserved. Their plays will be shown to another class followed by electricity conservation demonstrations.

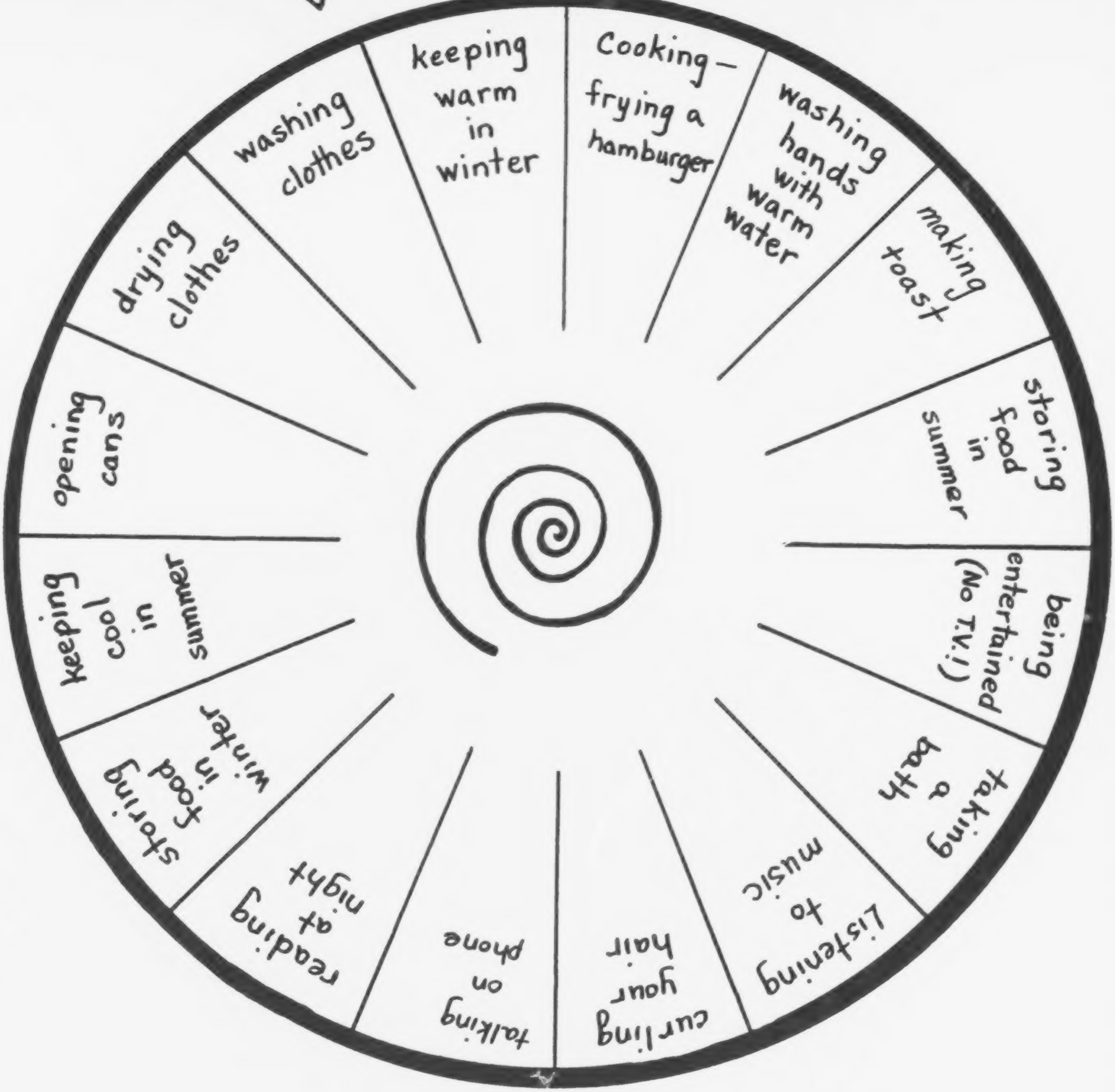
FOLLOW-UP/BACKGROUND/SUPPORT

Refer to background in the activity for further "electric facts." In 1935, the average household in the U.S. used 756 KW/Hs. In 1978, the average household used 9,918 KW/Hs, or about 14 times more electricity than what was used in 1935. We have become accustomed to a way of life made possible by the consumption of ever-increasing quantities of energy. And, all of these conveniences are linked in one way or another to fossil fuels. The students need to be reminded of this. Even turning off a light will save fossil fuels. About 2000 KW/Hs of electrical energy are used to light the average home for a year (remember, lighting accounts for only 10% of our energy needs.) But nonetheless, that means 150 gallons of oil or more than 3/4 tons of coal to be burned to fulfill this requirement.

SOURCE OF ACTIVITY

Janey Swartz

ELECTRICAL SPIN-OFFS


keeping warm in winter
Cooking—frying a hamburger
washing hands with warm water
making toast
storing food in summer
being entertained (No T.V.!)
taking a bath
Listening to music
curling your hair
talking on phone
reading at night
storing food in winter
keeping cool in summer
opening cans
drying clothes
washing clothes

What did they do then? (Pre-electricity)

Before curling irons

Before electric or gas furnaces

Before TV was invented

Before ovens

Before washing machines

Before clothes dryers

Before lights

Before air conditioners

On cold days, before people had furnaces

Before hot water heaters

Before refrigerators

children played games or read books for entertainment.

children bundled up with warm clothing and sat by the fire.

clothes were washed by hand in big tubs.

candles were burned in the evening.

they chopped up firewood to use for cooking.

children sat under the shade of a tree or swam in a nearby stream to cool off.

firewood was burned for warmth.

food was kept cool in cellars, or ice houses. Much of the food was dried.

clothes were hung out to dry in the wind and the sun.

girls curled their hair by wrapping their hair around wet rags.

water was heated on the fire to be used for bathing.

TITLE Consumption! My How You've Grown!

SUBJECT Language Arts, Social Studies **LEVEL** Intermediate

ACTIVITY IN BRIEF

Students conduct interviews to learn how various activities were energized in the past.

OBJECTIVE

Students will state reasons why we, as Americans, are consuming ever-increasing quantities of energy.

MATERIALS	**TIME**
handouts - I-15a, I-15b, I-15c, I-15d	awareness - 15-30 minutes
chart or transparency of unfinished statements (see application)	concept development - variable
awards as needed	application - 30-45 minutes

LEARNING CYCLE

AWARENESS - The students study a pictorial graph (see I-15a) which depicts the amount of coal and oil consumed per capita for each designated year. They complete the "I learned" statement and share these with their classmates. A class list is made dealing with possible reasons why the usage of coal and oil has been on the increase.

CONCEPT DEVELOPMENT - The students conduct an interview with 2 previous generations (Parents? Grandparents?) dealing with energy needs past and present. (See I-15b) The first interview is with the oldest person that the student can interview (grandparent, neighbor, etc.). The second interview is with someone about the age of the students' parents (uncle, aunt, mom, dad, friend, etc.). (I-15c could be used in conjunction with this activity)

APPLICATION - The students share and compare their interview results. Each student may finish one of the following statements: (Make a chart for everyone to see)

I learned that. . .
I was surprised that. . .
I didn't know that. . .
I forgot that. . .
I relearned that. . .
I discovered that. . .
I decided I would. . .

Each student also will sign a contract promising an action to reduce consumption of electricity. (See I-15d) Upon successful completion of the contract, an award would be presented. (I-15e)

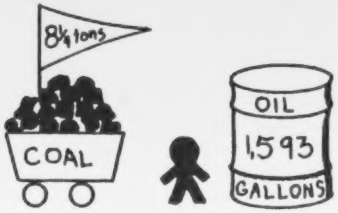
FOLLOW-UP/BACKGROUND/SUPPORT

Invite an older citizen from within the community to share their childhood energy use experiences with the students.

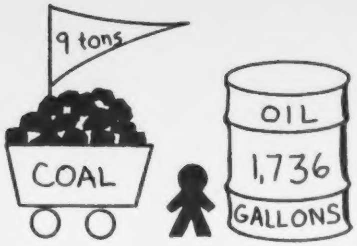
SOURCE OF ACTIVITY

Adapted from Watt's Happening.

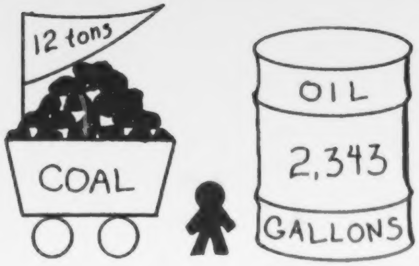
I-15a


8¼ tons
COAL
OIL
1,593
GALLONS

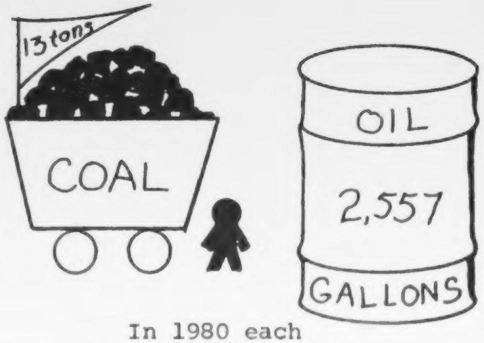
In 1950 each American used this much.


9 tons
COAL
OIL
1,736
GALLONS

In 1960 each American used this much


12 tons
COAL
OIL
2,343
GALLONS

In 1970 each American used this much.


13 tons
COAL
OIL
2,557
GALLONS

In 1980 each American used this much.

I am surprised that

I learned that

I feel that

I am going to save petroleum by

I-15b

When I was your age........

What did you do for:	**Grandparent** the year was ________	**Parent** the year was ________	**Me/Now** the year is ________
Transportation			
Home Heat			
Food (fresh, frozen, or canned			
Clothes Washing			
Food: cooking and keeping it cold			
Recreation - TV? Radio?			
Electrical appliances in kitchen			
What do you miss about the "good old days"?			

I-15c

When you were my age did you have a.........

Grandparents	Parents	Today 19__	
☐	☐	☐	T.V. set
☐	☐	☐	vacuum cleaner
☐	☐	☐	clothes dryer
☐	☐	☐	electric dishwasher
☐	☐	☐	electric toothbrush
☐	☐	☐	radio
☐	☐	☐	electric razor
☐	☐	☐	electric mixer
☐	☐	☐	phonograph
☐	☐	☐	air conditioner
☐	☐	☐	freezer
☐	☐	☐	refrigerator
☐	☐	☐	central heating
☐	☐	☐	automatic washer
☐	☐	☐	electric or gas stove
☐	☐	☐	blender
☐	☐	☐	power mower
☐	☐	☐	other:
☐	☐	☐	______________
☐	☐	☐	______________
☐	☐	☐	______________
☐	☐	☐	______________

I, ____________________________

do solemnly pledge to

conserve ________________

by __________________________

____

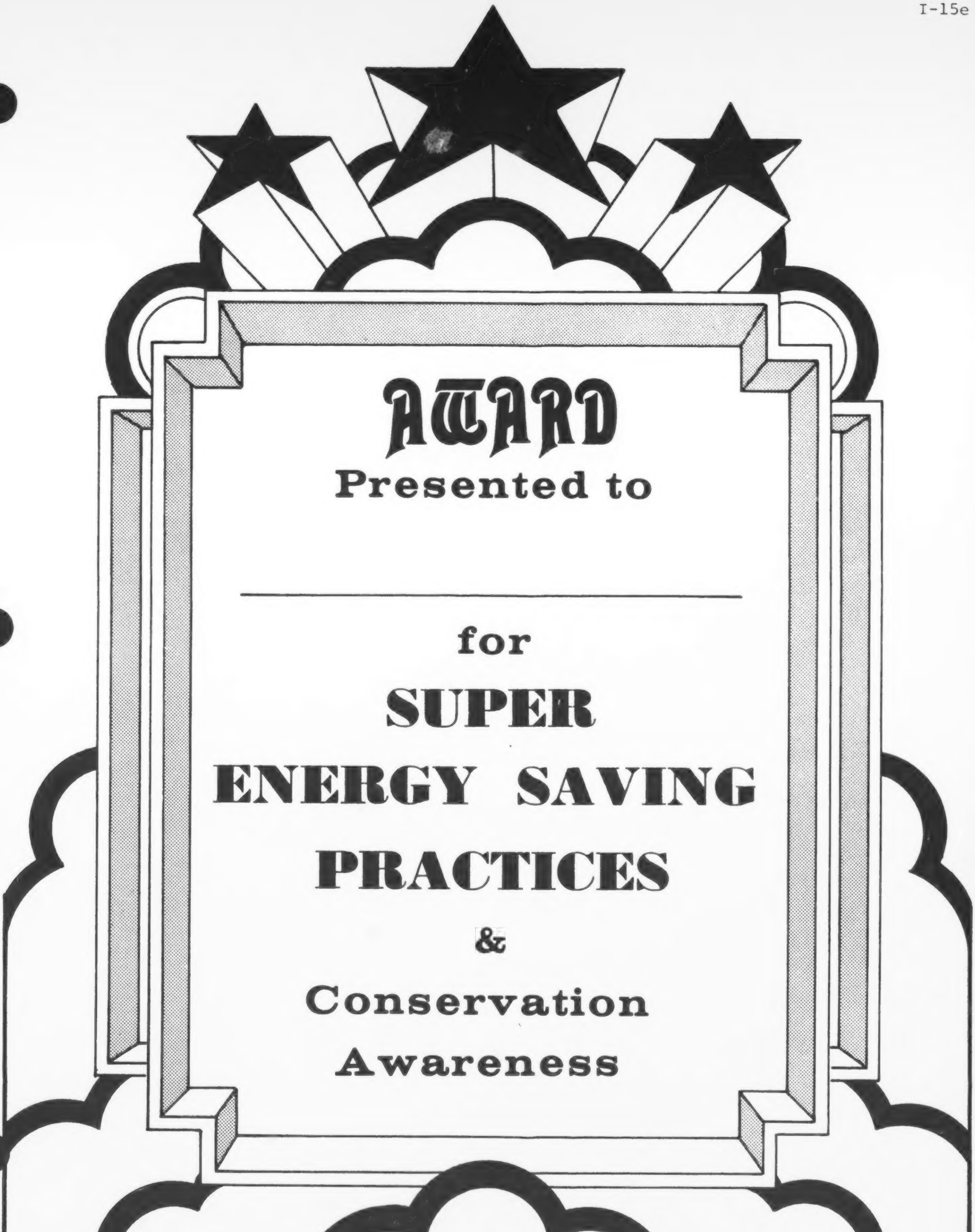
____

starting on this ___day of ______,

19___.

_________________ _________________

Signature Witness



AWARD

Presented to

____

for

SUPER ENERGY SAVING PRACTICES

&

Conservation Awareness

TITLE Catch a Sunbeam

SUBJECT All areas **LEVEL** Intermediate

ACTIVITY

Each student chooses a project to make to demonstrate solar energy at work.

OBJECTIVE

The students examine and experience the potential of the sun's energy.

MATERIALS	TIME
handouts - I-16a, I-16b, I-16c, I-16d, I-16e	awareness - 15 minutes
students collect materials for project selected	concept development - variable, as needed
	application - ongoing all day

LEARNING CYCLE

AWARENESS - The student considers the sun as a source of energy. The class makes a list of all possible ways to harness the energy of the sun. (The sun can heat a pool, tan our body, grow a plant, dry our clothes, warm a house, etc.)

CONCEPT DEVELOPMENT - The students study the pictures and describe the workings of each solar powered item. Each student chooses one project to make and demonstrate. (See I-16a, I-16c, I-16d)

APPLICATION - The students participate in a Solar Celebration Day. A schedule of events might include:

1. Greet the Sun. (Read A Way to Start the Day, by Byrd Baylor.
2. Write and share sun-sational poems, haiku, and sun shines.
3. Unlock and eat locked in sunshine by doing the orange activity. (see background).
4. Make a solar still.
5. Make and tell time with solar clocks.
6. Make a sundial.
7. Dry fruit, make tea, cook hot dogs, and bake brownies using solar energy gathering apparatus.
8. Make sun prints using chemically-treated paper or colored construction paper.
9. With paint brushes and buckets of water, create evaporating art work on the playground.
10. Design some solar experiments. (See I-16e)
11. Make shadow chalk pictures (trace around a shadow with chalk on the blacktop). Do a shadow show.
12. Sunbathe, soak up the sun. Lay in the round shape of the sun with rays radiating out.
13. Make leaf prints to exemplify the solar energy locked within.
14. Sing familiar or make your own sun songs.
15. Paint a sunset.

The Sun Celebration Day planning is limited only the boundaries of the imagination of teacher and students.

FOLLOW-UP/BACKGROUND/SOURCES

The Orange Activity

The children form a circle seated upon the floor or ground around a pile of oranges. Their legs are extended and spread to allow the teacher to roll oranges (sun rays) to each student. Each orange package has locked within it the energy of the sun or canned sunshine. The teacher directs the activity with the following dialogue:

> The sun is locked up within the orange package you are holding. Look carefully at this little package of energy. Observe the markings, its texture, any little bumps, nicks, grooves. How could you tell this orange from any other oranges? Smell it. Close your eyes and feel it. Touch it to your cheek. You will know it from all others because it is special to you.
>
> Now poke your fingernail gently into the outer skin. Remove a tiny fragment of the orange and smell it, then taste it. Experience the sensation.
>
> Starting at the point to which it was fastened to the tree, proceed to peel. If carefully done, the outer skin will fall away in one piece, depicting the sun's rays. Here is where the energy of the sun has been locked in little sections. Take one section out. Smell it, and observe it with the light passing through, then taste it. Feel the sun's energy as it becomes a part of your body. The sun, locked inside, is now going to give you energy. The sun's energy will be converted into energy for your body.
>
> Concentrate on the taste of the orange. Take one section and trade it with someone near you. Taste it. Compare it to your own. How does it differ? How are they alike? No two oranges are the same. Each tree uses the same sun but other factors enter in to cause the differences in the taste of each orange. There are differences in soil, differences in temperature, differences in amount of shade and so forth. But what each orange does share is the fact that without the sun, there would be no oranges. And the sun locks its energy within each orange and your orange passes on that energy to your body.
>
> Continue to eat your orange now and don't forget that the energy you'll be using today is coming from the sun!

FOLLOW-UP/BACKGROUND INFORMATION

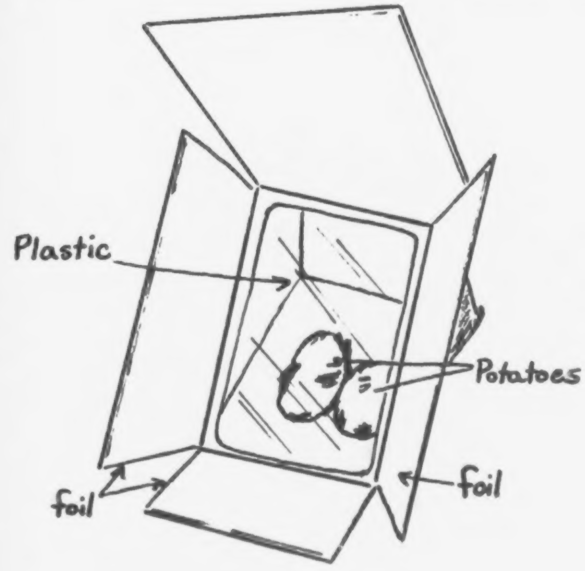
The sun is the primary source of all energy on earth. It is locked up within our fossil fuels. It supplies the energy for evaporation, starting the rain cycle. It is the parent of the streams and rivers and, which, if collected in dams, creates hydroelectricity. It heats the earth unequally giving rise to wind energy. The sun is the cleanest, most inexhaustible energy source. It is the energy challenge of the future. However, in Iowa, only about 1% of the energy used comes from direct solar energy.

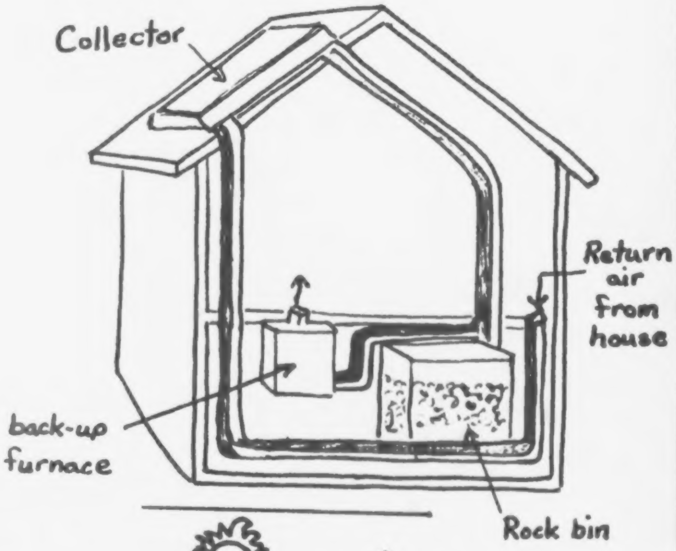
To understand more of the mechanics of solar energy, a resource person to talk on solar energy or a visit to a solar home would be beneficial.

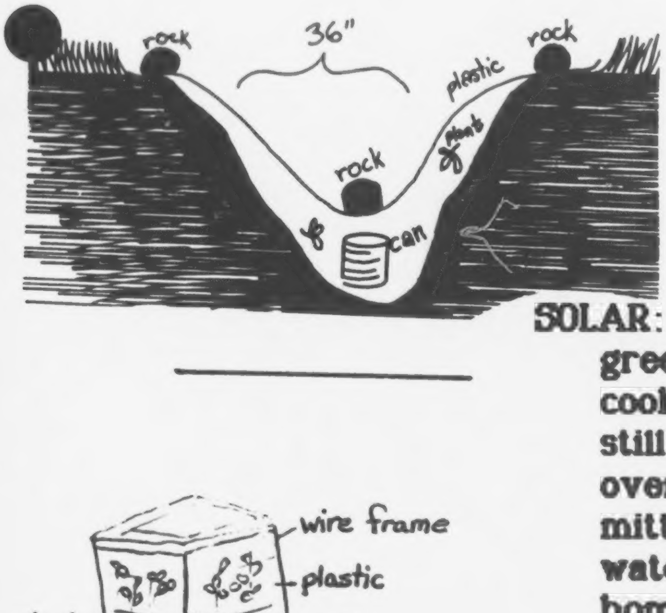
SOURCE OF ACTIVITY Janey Swartz
The Orange Activity by Duane Toomsen

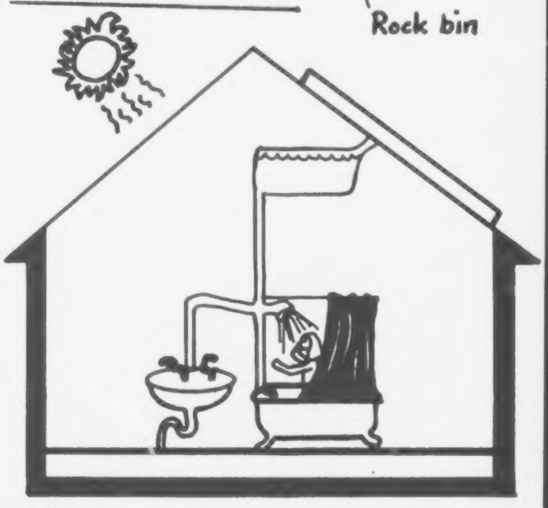
Catch a Sunbeam

Label each solar energy user and explain how each one works.

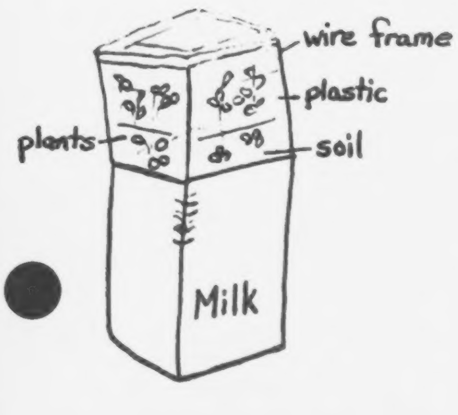

Plastic
Potatoes
foil
foil

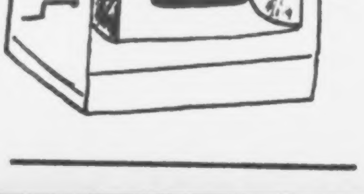

Collector
Return air from house
back-up furnace
Rock bin

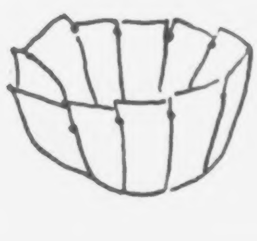

rock
36"
rock
plastic
plants
rock
can



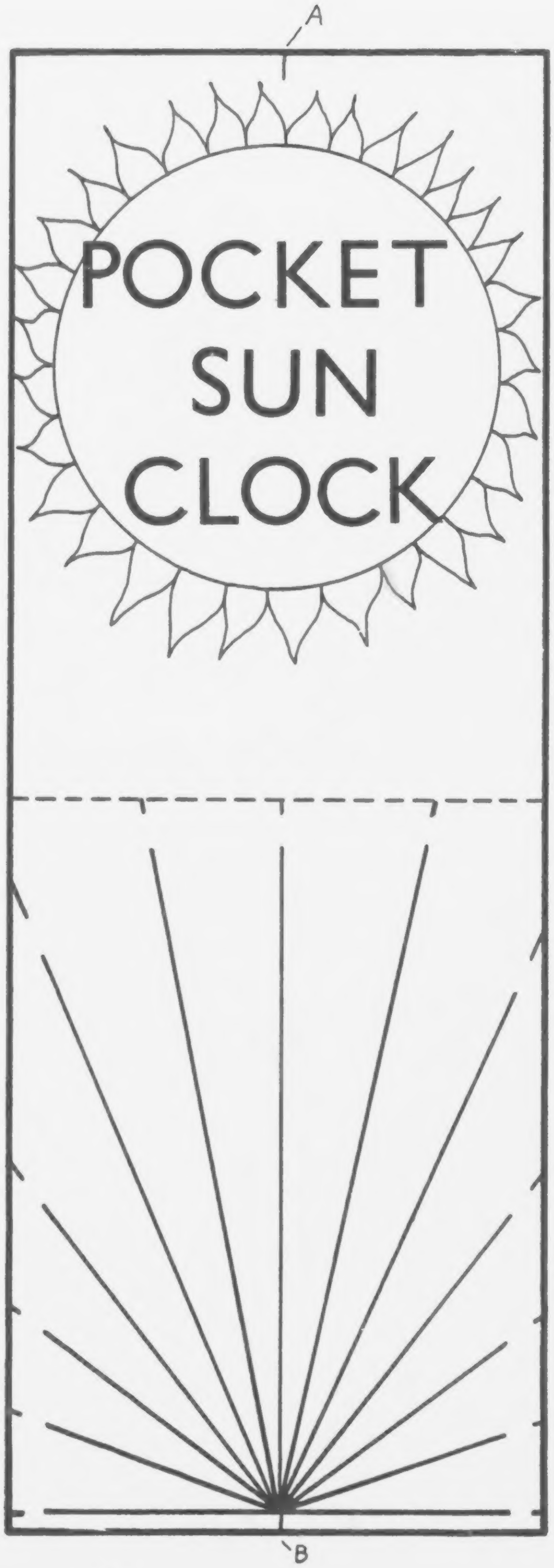
SOLAR:
greenhouse
cooker
still (water collector)
oven
mittens
water heater
home


wire frame
plastic
plants
soil
Milk

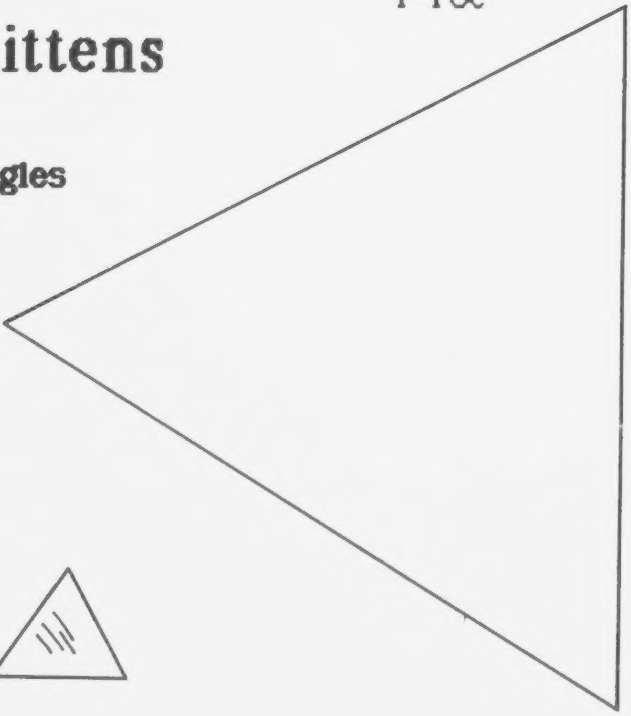




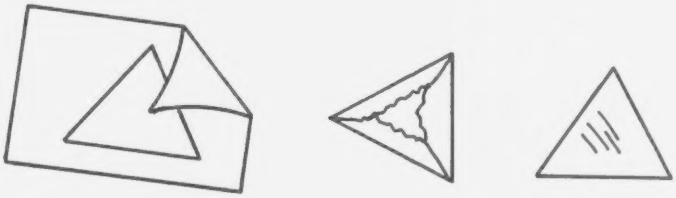
1. Cut out the sun clock.
2. Cut on lines A and B.
3. Fold on the dotted line so that the sun is at a 90° angle to the bottom half of the sun clock.
4. Draw a string from A to B with a knot at each end to keep it tight in place.
5. Note how the sun will cast a different shadow of the string on the clock, depending on the time of day.
6. Keep it in your pocket so you can tell the time!



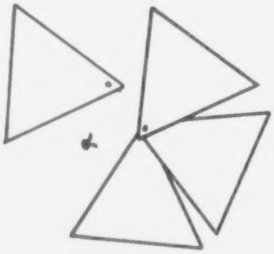
Sun Mittens



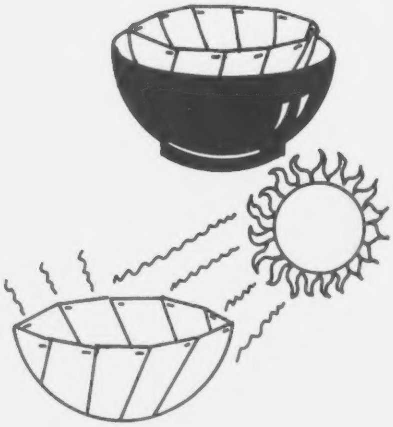
1. Cut out 10 of these triangles from any old lightweight cardboard you can find.
2. Wrap each triangle with aluminum foil so it's covered on one side. Keep the foil smooth.



3. Punch a hole in one point of each triangle.
4. Attach all the triangles together with a paper fastener.



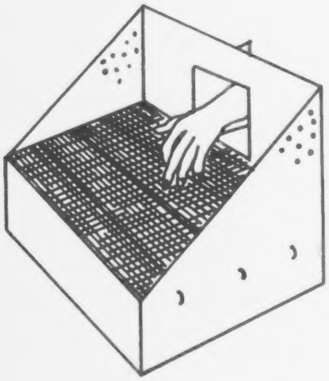
5. Spread out the triangles into a flat circle. To make it bowl-shaped, press the circle into a small bowl.
6. When it is bowl-shaped, staple the outside edges.



7. Place the hand warmer outside in the sun. When your hands need to be warmed up, hold them in the bowl for a while and they'll warm up.

Hurrah for sun power!!

Solar Fruit Dryer



You need:
-cardboard box (15" or taller)
-black paint
-fiberglass, plastic, or aluminum screening (Do NOT use galvanized)
-3 coat hangers (or strong wire)
-clear vinyl (window covering plastic is good)
-duct tape

1. Cut off sides and front of box as shown.

2. Paint the inside of the box or cover it with black paper.

3. Cut a door in the back. Make the "hinge" part stronger with duct tape.

4. Poke holes on the side with a pencil.

5. Run 3 wires 6" from the bottom of the box. (This will form the rack to hold the screen.)

6. Cut screening to fit the length and width of the box.

7. Place the screen on the rack.

8. Tape the clear covering (vinyl) snugly over the top of the box.

How to use your solar fruit dryer.

-Put fruit on the screen rack. Tape the door shut so heat can't escape.
-Put the dryer on concrete or asphalt, outside, aimed directly at the sun. Keep adjusting it as the sun moves.
-Keep the vinyl clean and tightly attached.
-Clear sunny warm days are best for drying.

Name

Question: **What is the best color to catch the sun's rays? (black or white?)**

teacher's seal of approval

I will

I need these things:

Conclusion: I discovered that:

Question: **What material (sand, water, salt, paper) stores the sun's heat the longest?**

teacher's seal of approval

I will

I need these things:

Conclusion: I discovered that:

TITLE The Winner is — the Envelope Please

SUBJECT Science **LEVEL** Intermediate

ACTIVITY IN BRIEF

A mock-beauty contest is staged with six students representing the future energy sources. Each representative will provide advantages and disadvantages of each energy source resulting in a vote being taken to determine the winner.

OBJECTIVE

The students will be able to identify energy sources of the future and state the pros and cons of each.

MATERIALS	TIME
resource material on future energy sources	awareness - 2 class sessions
items from home as needed	concept development - 45-60 minutes
	application - 30 minutes

LEARNING CYCLE

AWARENESS - The students divide into small groups. Each group is assigned an energy of the future (SOLAR - GEOTHERMAL - NUCLEAR - WIND - BIOMASS). They gather and record information regarding their energy source including advantages, disadvantages, availability, etc.

CONCEPT DEVELOPMENT - The students collect materials they need to create their energy source "beauty person." Emphasize the importance of creating an attractive candidate, which is similar to what government and companies do to gain public support. On a designated day, the students put together their personified energy representative. Using a sort of "Miss America"-type format, each energy representative will parade down a ramp. A spokesperson from the group describes the attributes and disadvantages of this energy source of the future. A master of ceremonies will conduct an interview of each contestant. Some pertinent questions that may be used include:

1. Why do you think you should be chosen as the energy source of the future?
2. What makes you special from all the rest?
3. What do you feel are your weaknesses?
4. If you are chosen "Energy Source of the Future," how will you change the world?

APPLICATION - With careful deliberation, each student will cast a vote for the "Energy Source of the Future" which will best serve the needs of our world. Letters will be written to the Department of Geological and Natural Resources, asking for the increased research and development of the chosen "Future Energy Source." To save energy, time, and money, all letters should be mailed in one large envelope.

FOLLOW-UP/BACKGROUND INFORMATION

The students will be encouraged to bring energy-related articles, pictures, and newspaper accounts to be added to bulletin boards, mobiles, scrapbooks, etc. This will be an ongoing activity.

The challenge of the future is: to become less dependent on sources of energy that are in danger of running out, and; to develop and use energy sources whose availability is renewable and whose use will not disrupt or pollute the environment.

SOURCE OF ACTIVITY

Janey Swartz

ENERGY SOURCE	*ADVANTAGES*	*DISADVANTAGES*
SOLAR		
WATER		
WIND		
BIOMASS		
NUCLEAR FISSION		
GEOTHERMAL		
OCEAN TIDES FALLING WATER		

TITLE Twinkie Twinkie That's Your Name
How I Wonder From Where You Came

SUBJECT Social Studies **LEVEL** Intermediate

ACTIVITY IN BRIEF

The students trace the flow of energy from the source of the raw materials to the final production of a Hostess Twinkie.

OBJECTIVE

Children trace an energy flow from source to the community.

MATERIALS	TIME
twinkie large sheet of paper, markers, crayons, etc. large world wall map string, pins	awareness - 30-40 minutes concept development - 45-60 minutes

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LEARNING CYCLE

AWARENESS - Twinkie is placed in a prominent position. The teacher states that there is a lot of energy packaged in this item. The class makes a list of all the raw materials used in producing the twinkie; categorizing each as renewable or non-renewable.

RENEWABLE	NONRENEWABLE
sugar	petroleum (ink)
tree (cardboard)	petroleum (wrapper)
flour (wheat)	
eggs	

etc.

CONCEPT DEVELOPMENT - Students form groups of three or four. They draw a twinkie in the center of a large sheet of butcher paper. A mural or poster is created showing the energy involved in getting these products to the store shelf. (The gasoline for the tractor in the wheat field. . . the tanker fuel carrying sugar cane, etc.) Upon completion, each group shares with the larger group.

APPLICATION - A large world map is displayed and strings are stretched (using pins or tape) from the community to the various locations where the raw materials are obtained. Little tags label the products.

I-18continued

FOLLOW-UP/BACKGROUND INFORMATION

More strings could be attached to the map throughout the energy unit so that the students can better visualize a world-wide perspective and energy flow.

The world recycle might be included in this activity. Some paper products can be recycled. It takes less energy to recycle cans and paper than it takes to produce these products from the raw materials. Cans and newspapers are products easily recycled. There are many items which could be recycled if we use our creativity and resourcefulness. Give each child a grocery sack and see how many uses can be made of the sack. Make recycled paper (see 18a). Display recycled paper products. Encourage creativity with items we normally throw away.

SOURCE OF ACTIVITY

Adapted from Minnesota Energy Activities, "Big Mac," by John and Deb Miller.

I-22 continued

* Covering the pot saves energy. It doesn't take as much energy to get something to boil if the lid is on.

* The stove uses more energy to boil something rather than to simmer it. Most things cook just as well if simmered rather than boiled.

* Keeping car tires properly inflated saves gas. Underinflated tires can decrease fuel economy as much as 1 mile per gallon. Radial tires may give you from 0.5 to 1 more mile per gallon.

SOURCE OF ACTIVITY

Janey Swartz

TITLE Energize Me!

SUBJECT Science **LEVEL** Intermediate

ACTIVITY IN BRIEF

The students evaluate their home environment by filling out an energized home report card.

OBJECTIVE

The student will be able to note energy savings in an "energized" home.

MATERIALS	TIME
report card for each student - I-19a	awareness - 15-30 minutes
contract for each student - I-19b	concept development - 30-45 minutes
awards as needed - I-19c & I-19d	application - 15 minutes

LEARNING CYCLE

AWARENESS - Each student receives a copy of "The Energized Home Report Card" (see I-19a). The teacher and students read and discuss how each statement positively affects energy conservation.

CONCEPT DEVELOPMENT - The student takes the report card home and "grades" each item. The help of the family may need to be solicited.

APPLICATION - The student decides what energy saving steps will be implemented at home. A contract is drawn up (see I-19b). Six weeks later, the student's home is re-evaluated. An award is presented to anyone whose energy home report card has improved. (See I-19c and I-19d)

FOLLOW-UP/BACKGROUND INFORMATION

The student could solicit several volunteers to take part in an energy-audit. Each volunteer would grade his/her home and a follow-up evaluation would determine if energy saving practices had been put into use. The student would receive an award if the volunteer's report card had improved.

One should realize that of the total energy used in homes, 70% is used to heat and cool the home, so energy saving actions should start here: insulating and weatherstripping in the home is important for energy savings (air leakage contributes to 30 to 40% of the heating bill). 20% of the total energy consumed is used to heat water, and 10% is for lights, cooking, and small appliances.

The importance of proper insulation can be demonstrated with experiments (see I-19e).

SOURCE OF ACTIVITY Janey Swartz
Awards by Rose Wilson

The Energized Home Report Card of ______________________________

A = Always = 10
B = Usually = 8
C = Sometimes = 5
D = Hardly ever = 2
F = Never = 0

Electricity	Date	Date
• Light bulbs and shades are clean.		
• Our hot water heater is set at ______ 110° = A 110°-125° = B 125°-140° = C 140°-...?... = D		
• The hot water heater is insulated.		
• The refrigerator coils at the rear or bottom are clean and free of lint.		
• The refrigerator is not crowded so there is free air flow.		
• The refrigerator is set at 38-40°.		
• Frost in the freezer is less than 1/4" deep.		
• Stove reflectors are clean.		
*• Door seal on oven door is tight.		
*• Door seal on refrigerator is tight.		
*• Door seal on freezer is tight.		

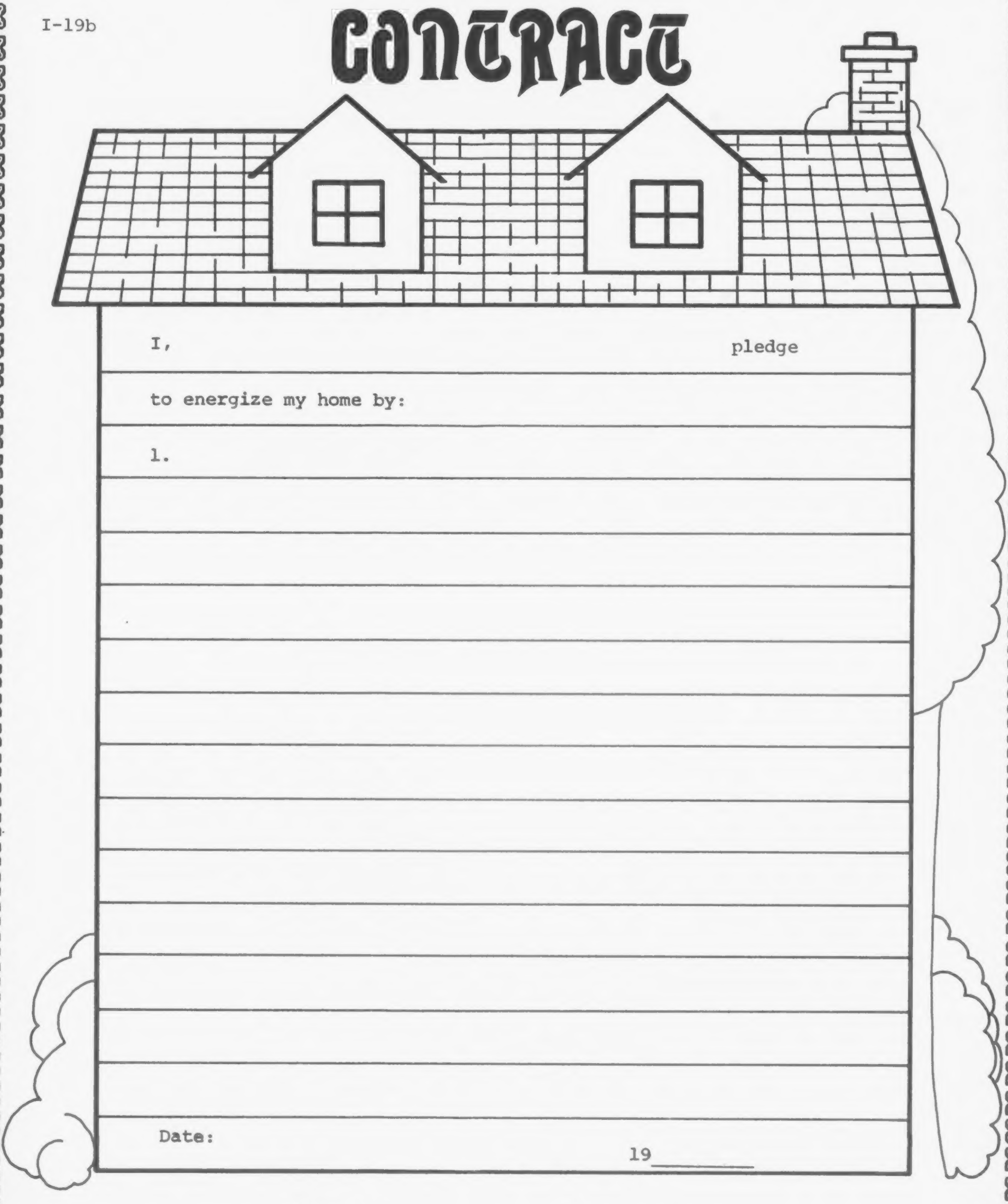
* The test for door seals is this. Close the door on a dollar bill. If you can remove it the door is too loose, and a new rubber gasket is needed.

Water	Date	Date
• A brick is in the toilet water tank.		
• There are no dripping faucets.		

Heating and Cooling		
• Thermostat is set for 68° or less in winter.		
• Air conditioner is set for 78° or higher in summer.		
• Furnace filters are changed once a month.		
• Doors and registers are shut to rooms not in use.		
• Storm windows and doors are installed, weather-stripped, and caulked.		
• Foam gaskets are installed behind outlet and switch plates to keep cold air from coming in.		
• Attic floors are insulated.		
• Floors over unheated rooms are insulated.		
• Exterior walls are insulated.		
• Attic walls are insulated.		
• Heat ducts are not blocked.		
• There are evergreen trees on the north.		
• There are deciduous trees, vines, or shrubs on the south and west to help shade windows in the summer.		
• The first 10 feet of copper pipe coming from your water heater is insulated.		
• Insulated curtains are installed.		
• Plastic covers on windows in the winter (or storm windows are used).		

I-19b

CONTRACT



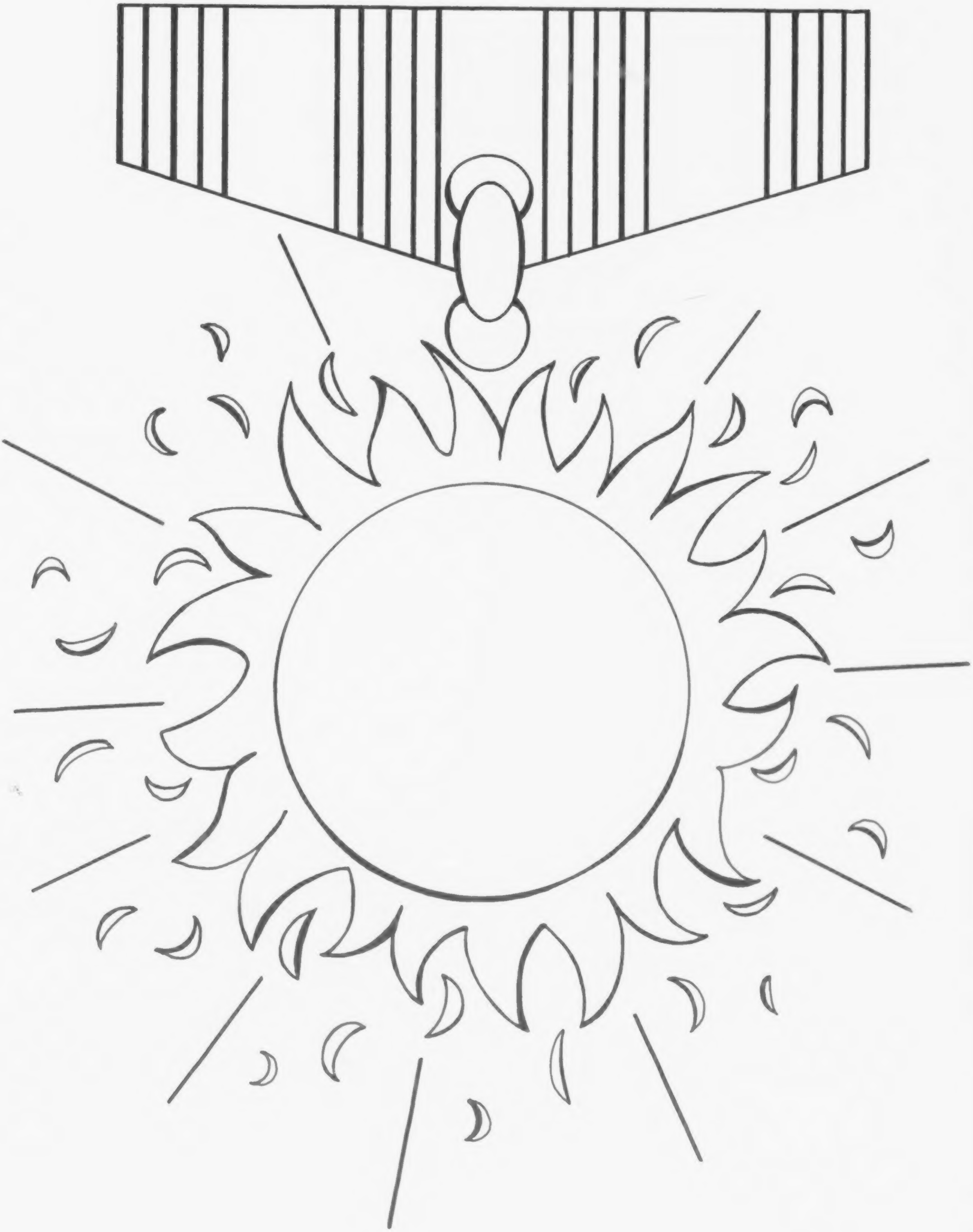
I, ______________________________ pledge

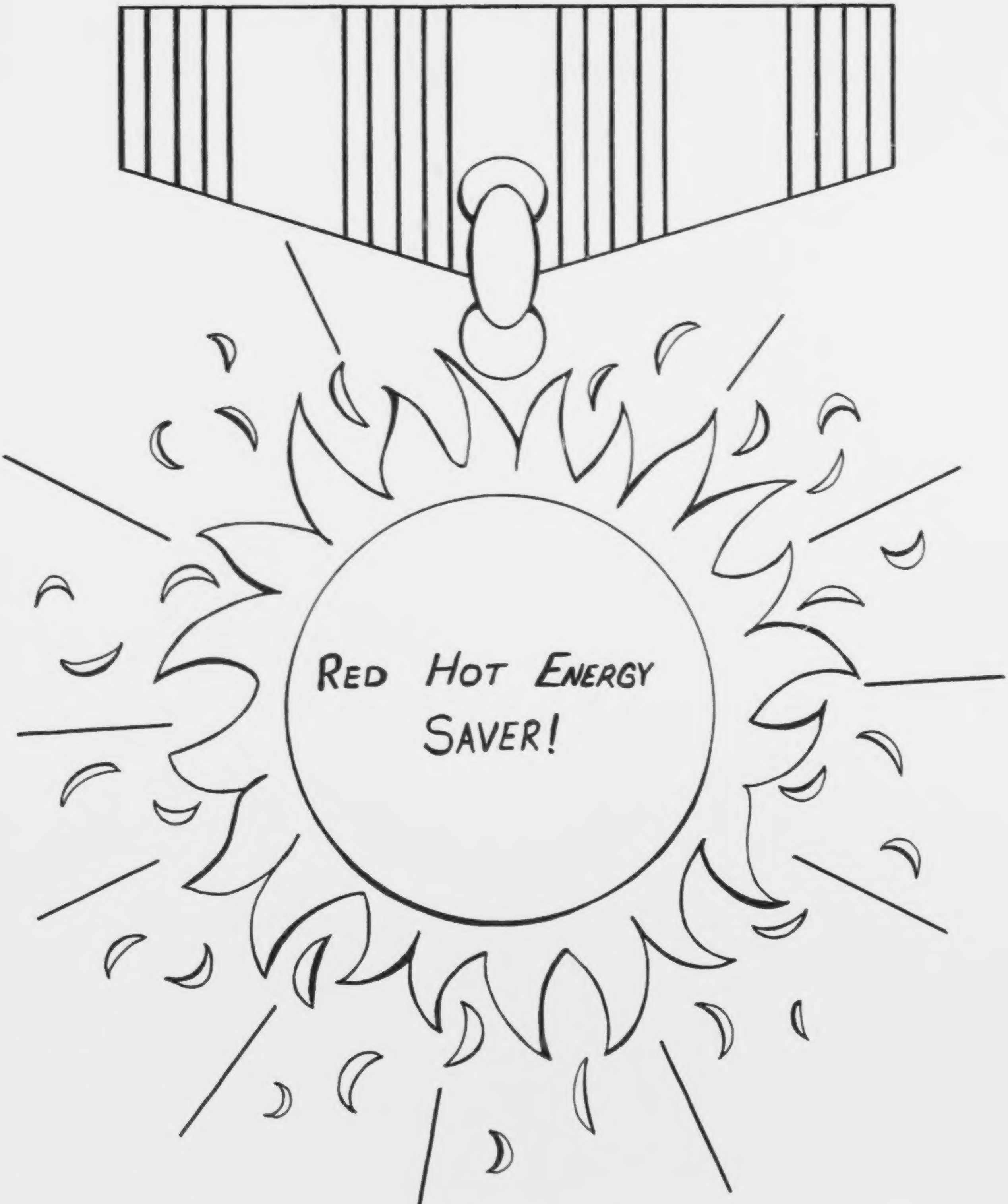
to energize my home by:

1. ______________________________

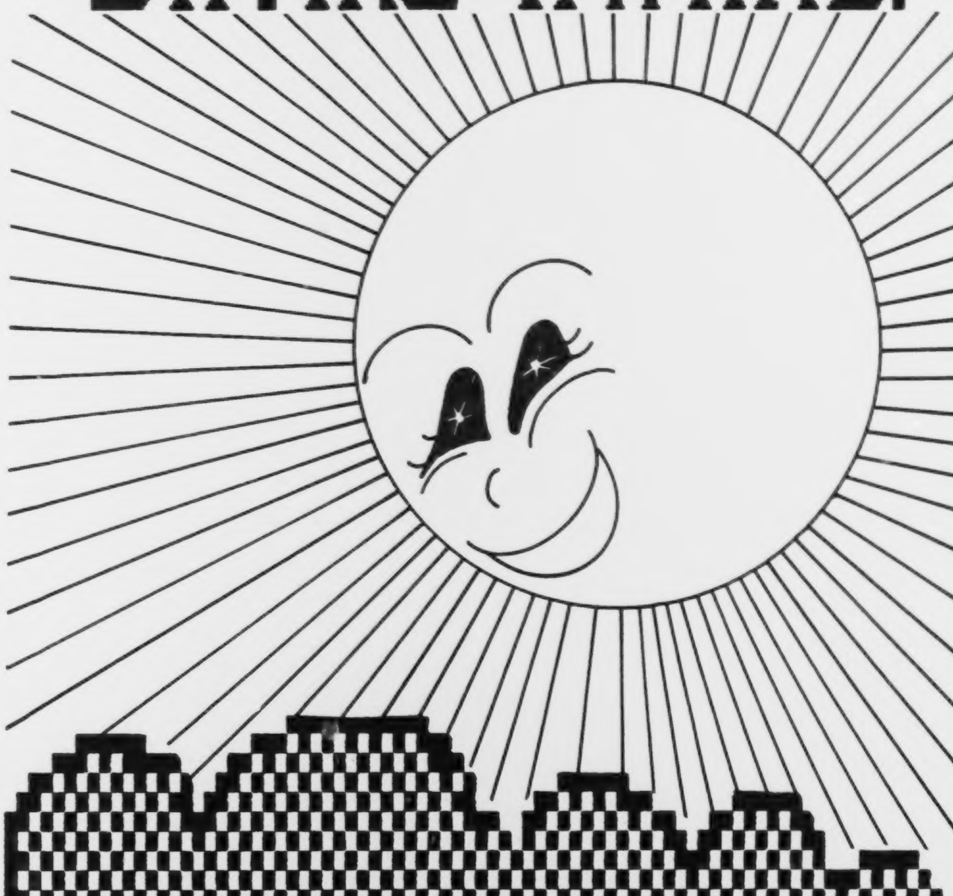
Date: ______________________________ 19______

Signature: ______________________________




RED HOT ENERGY
SAVER!

SUPER ENERGY SAVING AWARD!



PRESENTED TO:

____

TITLE Home Sweet Warm Home

SUBJECT Math **LEVEL** Intermediate

ACTIVITY IN BRIEF

A simple hand-count survey is taken on the types of energy/fuel used in heating students' homes. Students graph the results and make comparisons and inferences. Emphasis will be on comparing 1) energy sources (including alternative sources), 2) costs, and 3) environmental impact.

OBJECTIVE

Students will graphically compare various types of energy used to heat our homes. They will make cost comparisons and value judgments concerning renewable vs. nonrenewable energy sources.

MATERIALS	**TIME**
handouts - I-20a	awareness - 10 miutes
butcher paper	concept development - 15-20 minutes
	application - 45-60 minutes

LEARNING CYCLE

AWARENESS - The teacher will demonstrate surveying and graphing processes by making a chalkboard graph of students who use electric stoves at home and those who use gas stoves. Students will see how graphs can visually show comparisons.

CONCEPT DEVELOPMENT - The students will take a hand count of the source of energy used to heat their homes and the results will be graphed (see I-20a) by the students. They will discuss alternative energy sources (solar, wood, biomass, geothermal, etc.). The students can speculate upon the reasons for the percentage of homes using each particular energy source (cost, availability, convenience, lifestyle). The terms renewable and nonrenewable should be used with each energy source being discussed.

APPLICATION - The students will conduct similar surveys in other classes to get a more comprehensive sampling of the area's predominant fuel sources for heating the home. The results are brought back and graphed to make a whole-school comparison. Students divide into small groups. Each group is given one energy source and a large piece of butcher paper. They are to focus on that energy source and picture all the events, equipment, energy expended, etc., surrounding the production and procurement of that energy source. The students will share their projects with each other. Each student, then, will prioritize the heat sources by listing the energy sources from least to most desirable.

FOLLOW-UP/BACKGROUND INFORMATION

The historical aspects could be researched and compared graphically. Students could survey their grandparents and compare the ways they heated their homes with the ways students' homes are heated. Inferences could be drawn about lifestyle, availability, costs, etc.

SOURCE OF ACTIVITY Madonna Carber, Northeast Camanche Elementary

1-20a

Home Sweet Warm Home

How is your home heated?

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
By electricity																							
By gas																							
By oil																							
Solar																							
Wood																							
Coal																							
Other?																							

Most homes were heated with ____________________.

Hardly any were heated with ____________________.

I think the best way to heat a home is by

______________________ because ______________

____.

TITLE Making the Grade!

SUBJECT All areas **LEVEL** Intermediate

ACTIVITY IN BRIEF

The student evaluates his/her energy lifestyle using a report card format.

OBJECTIVE

The student will be able to describe some every day energy conservation practices. A conservation ethic will be established.

MATERIALS	TIME
report card for each student - I-21a	awareness - 30-45 minutes
contracts - I-21b	concept development - 30 minutes
I-21c and I-21d (optional)	application - variable

LEARNING CYCLE

AWARENESS - Each student receives an energy report card (see 21a). The teacher and students read and discuss how each action positively affects energy conservation.

CONCEPT DEVELOPMENT - The student completes each report card item and determines a grade for each item on the report card.

APPLICATION - The student re-evaluates his/her lifestyle and makes a commitment to take certain energy conserving actions. A contract is drawn up and signed by the student regarding those changes in behavior (see I-15d). Six weeks later the student re-evaluates his/her behavior. Any improvement would necessitate an award. (See I-15e, I-19c or I-19d)

FOLLOW-UP/BACKGROUND INFORMATION

This could become an ongoing activity, with regular grading schedules, four or more times a year. New items may be added. Perhaps the students could use their own report card format. I-21b may be used as a follow-up.

SOURCE OF ACTIVITY

Janey Swartz

Energy Report Card of ____________________

A = Always = 10
B = Usually = 8
C = Sometimes = 5
D = Hardly ever = 2
F = Never = 0

Electricity	Date	Date
• I turn off lights I'm not using (and when I leave the room).		
• I use natural light (sunlight) whenever possible.		
• I turn off the T.V., radio or stereo when I'm not using them.		
• I don't stand looking in the refrigerator with the door open. I close it as quickly as possible.		
• I wash only full load in the dishwasher…and in the washing machine.		
• I use the clothesline on warm windy days instead of using the dryer.		

Water		
• I keep water in the refrigerator to cool it instead of running the faucet to cool it.		
• I don't leave the water running while I'm brushing my teeth or sudsing up my hands.		
• I shower instead of bathing and save up to 10 gallons of water each time.		
• If I wash dishes by hand, I don't leave the water running to rinse each plate separately.		

Heating and Cooling	Date	Date
• I wear extra warm clothing in winter and keep the thermostat down		
• I turn the thermostat down at night and use extra blankets.		
• I open curtains when the sun is shining and close them when it isn't shining (in the winter).		
• I close the curtains when the sun is shining in (on warm summer days)		
• I do not use an air conditioner unless it is very, very hot.		
• I do not use an air conditioner at all.		
• I keep doors and windows shut while air conditioner or furnace is running.		
• I do not stand in the doorway with the door open to talk to someone.		

Transportation	Date	Date
• I ride my bike whenever possible instead of using the car. (or I walk)		
• I carpool whenever I can!		
• I try to make only necessary trips in my car. (I save-up errands to do in one trip.)		
• I always check to see that the tires are properly inflated.		
• I turn off my car when I am waiting (at drive-up windows for a train, while someone runs into the store, etc.)		

In the Kitchen	Date	Date
cooking mostly!		
• I bake several things at once. I don't turn the oven on for only 1 thing.		
• I don't "peek" in the oven because I know each peek drops the temperature 25-50 degrees.		
• I use a burner the same size as my pan.		
• I turn off the oven or burners a few minutes before the food has finished cooking. (I use the stored-up heat that's already there.)		
• I "simmer" instead of "full boil".		
• I keep the lid on the pan so it will heat up faster.		
• I do not preheat the oven		
• In the winter I thaw out frozen food in the refrigerator so it won't cool the room.		
• In the summer, I thaw out frozen food in the room so it will cool the room.		
• I clean the refrigerator coils.		
• Dishes are "air dried" to add heat and humidity to the room in the winter and to save electricity.		

Petroleum	Date	Date
• I do not use styrofoam cups and plates.		
• I do not use plastic utensils.		
• I use paper sacks - not plastic bags - for sacking produce at the grocery store.		
• I use reuseable containers (not plastic wrap) for sandwiches, etc.		
• I bring my own box or bag to the grocery store rather than use the store's plastic bags.		

Should You Shower or Bathe?

Take a bath

Fill your tub with water as usual. Before you step into the tub, measure the depth of the water.

Bath water ______inches.

Take a shower

Do this when you need one. Before you begin, close the bathtub drain so the shower will collect in the tub. When you have finished with your shower, measure the depth of the water that has collected.

Shower water ______inches.

What is the difference in the amount of water you used?

________inches

* A surprising fact is that if people took ____________

instead of ____________ a lot of energy would be saved.

I-22

TITLE Is That a Fact?

SUBJECT Reading, Art **LEVEL** Intermediate

ACTIVITY IN BRIEF

The class reads a fact related to energy consumption. The student designs a banner, button, bumper sticker, or flyer stressing an energy saving behavior dealing with that fact. Each student tries to convince someone to make a change of behavior to save energy.

OBJECTIVE

Students will be able to demonstrate their values by presenting energy conservation ideas to another person.

MATERIALS	TIME
art materials as needed by the students contracts - I-22a handouts	a daily 15-20 minute project

---

LEARNING CYCLE

AWARENESS - A "fact for the day" is written on the board for the children to discuss. (See background for a "starter list")

CONCEPT DEVELOPMENT - The student considers an energy-saving action having to do with the fact for the day. Each student designs a bumper sticker, banner, button, or flyer to distribute to someone, such as a neighbor, relative, friend, etc.

APPLICATION - If the student can find a "convert" (someone who will agree to sign a mini-contract (see I-22a) promising to put the energy saving practice into action) he/she can earn a star on the super star converter chart. (See background) Use the conservation quiz to stimulate ideas and discussion. (See I-22b)

FOLLOW-UP/BACKGROUND INFORMATION

A class chart can list energy saving practices. Each student who convinces someone to participate will earn a star.

Super Star Converters	BEN	ANN	SUE
I walk when I can		★	
I will lower the thermostat	★		

Here is a starter list for the teacher to use. Every day one statement should appear on the chalkboard. The students will consider the statement and brainstorm possible energy saving actions dealing directly with the fact of the day:

- Changing the home thermostat by one degree will change heating requirements by about 3 percent. (Reducing the setting from 70° to 68° will save 6%.) By turning the thermostat down 10° from 10:00 p.m. you can save 15-20% from your heating bill.
- A light bulb consumes less energy during its starting stage than during a single second of normal operation. (Always turn lights off when they are unnecessary, even for a few seconds.)
- 4/5 ounce of oil is burned each minute the electric dryer is used. 1/10 cubic feet of gas is used each minute the gas dryer is used.
- 1. Do not run the dryer longer than necessary.
  2. Clean the lint filter each time the dryer is used.
  3. Don't dry half loads. Fill the machine before using.
  4. Use the clothes line whenever possible.
- If we raise the average to 2 people riding in each car, the nation could save 5 billion gallons of gasoline a year. Carpool when possible.
- Each peek in the oven drops the temperature 25° to 50°. Don't open the oven door unless necessary.
- If you are away, energy will be saved if you lower your heat to about 50°.
- A lot of energy will be saved if rooms not being used are closed off to heat or air conditioning.
- Using the sun in the winter can save energy. By closing the curtains at night, you can keep the heat in your house.
- In the summer you can use curtains to keep the sun out. In the winter, you can use the sun to heat by opening the curtains, and then by closing them at night, you can help keep the heat in your house. Wise use of curtains can save as much as $15.00 out of each $100.00 spent for heat.
- Hot water heating, stoves, and refrigerators use up $1.00 out of every $5.00 spent for energy.
- Insulation of the hot water tank can save you $10.00 or more each year on energy cost.
- The U.S. citizen throws away an average of 1 ton of trash yearly.
- Of the total energy used in homes, 70% is used to heat and cool the home, 20% is used to heat water and 20% is for lights, cooking, and small appliances.
- Electric blankets use only small amounts of electricity. You can turn the house heat down at night, to 60° or below, and still stay warm. Use a sheet, the electric blanket, and heavy covers on top to keep the heat next to your body. Wear a stocking hat!

- Insulation in the attic could save $15.00 out of each $100.00 usually spent for heat.

- Dressing for warmth and turning down the heat saves energy. Wool and polypropolene are much warmer than man-made fabrics like nylon and rayon.

  Wearing several layers of clothing keeps you warmer than 1 heavy layer would.

- Wear long underwear (wool or polypropolene is best) and save energy by turning down the heat.

- Cracks, holes, and leaks rob you of heat. Leaks can cost you up to 20% of your heat bill. Sealing up windows, doors, chimneys, foundation can save lots of energy!

  Small cracks and openings around doors and windows let as much heat escape as a large open window would!

- A lot of heat is lost through the floor. Covering the floor with rugs (or several layers of newspapers with rugs over these) will save energy.

- You save energy if you turn the heat down when you leave the house even for a few hours.

- The average family of 4 uses about 65 gallons of water each day.

  Bath = 30 gallons
  Shower = 20 gallons
  Load of dishes = 10 gallons
  Automatic washer = 32 1/2 gallons
  Washing hands = 2 1/2 gallons (if you keep it running the whole time)
  Brushing teeth = 1 gallon (if you keep it running while brushing)

- Changing furnace filters once a month saves energy.

- Keeping cars in tune could reduce our gas consumption by 10%.

- Reducing the temperature of the water heater to 110° would save 15-20% a year on our electric bill.

- Petroleum is conserved if plastic utensils, styrofoam cups, plastic bags, plastic sandwich bags, styrofoam plates were not used.

- Two ways we make our refrigerators use more energy are by opening the door more than necessary and by putting warm things inside them.

- Making water hot takes a lot of energy. It takes about 1 ounce of fuel oil, or 1 cubic foot of natural gas, or 1/4 kilowatt of electricity to heat 1 gallon of water!

- About 2000 kw/hrs. of electrical energy are used to light the average home for a year. 150 gallons of oil or more than 3/4 ton of coal must be burned in a power plant to produce this amount of electricity for your home.

- Covering the pot saves energy. It doesn't take as much energy to get something to boil if the lid is on.
- The stove uses more energy to boil something rather than to simmer it. Most things cook just as well if simmered rather than boiled.
- Keeping car tires properly inflated saves gas. Underinflated tires can decrease fuel economy as much as 1 mile per gallon. Radial tires may give you from 0.5 to 1 more mile per gallon.

SOURCE OF ACTIVITY

Janey Swartz

I promise to____________________________________
in order to save energy.

____
(signature)

- -

I promise to____________________________________
in order to save energy.

____
(signature)

- -

I promise to____________________________________
in order to save energy.

____
(signature)

- -

I promise to____________________________________
in order to save energy.

____
(signature)

- -

I promise to____________________________________
in order to save energy.

____
(signature)

- -

I promise to____________________________________
in order to save energy.

____
(signature)

CONSERVATION QUIZ

Dripping hot water faucet	Room with thermostat set at 68° or lower	Lights on in an unoccupied room	Electric can opener	Car making a quick stop	Washing machine with cold water only
Grow a garden	Electric blanket	Doors and windows closed in cold weather	Car easing to a smooth stop	TV off when no one watching	Car pool
Public building too hot or too cold	Fluorescent lights	Outside lights burning during the day	Lamps with more than 70 watt bulbs	Car with only one passenger	Take showers instead of baths
Car coming to a quick stop	Wear sweaters and warm clothing in cold weather	Bicycle instead of using car	Electric toothbrush in use	People walking to work or school	Car speeding over 55 mph
Sun allowed to shine into home to give warmth	Color TV	Door or window open with heat or air conditioning on	Full loads in the washing machine	Room with thermostat above 68°	Conserve paper
Car idling with no driver	Lights off when no one using them	Electric knife in use	House with no storm windows	Clothes hanging out to dry	Rycycling of paper, glass, metal

Directions

1. Mark each block with an x when you actually find what is described.
2. Color the blocks red which show a waste of energy.
3. Color the blocks yellow which show saving of energy.

TITLE Saving Energy Makes Good Cents

SUBJECT Math **LEVEL** Intermediate

ACTIVITY

Students work math problems relating to energy and cost of consumption.

OBJECTIVE

Students will be able to measure how certain energy reductions would be cost-saving.

MATERIALS

handouts - I-23a

TIME

awareness - 30 minutes
concept development - 45 minutes
application - 30 minutes

LEARNING CYCLE

AWARENESS - Students are given a list of appliances with facts pertaining to energy costs. They must estimate how many hours a month and a year their family uses each appliance. (See I-23a) Since family's help may be needed, this project could be homework.

CONCEPT DEVELOPMENT - The students do calculations to arrive at cost per month and cost per year to run each appliance. Before arriving at the final energy expenditure for the year, make predictions of energy costs per month. Students will then find their actual average energy costs per month.

APPLICATION - Students will rate the items they use according to cost. They will determine which items cost the most to operate in a year. Students will evaluate their consumption of energy and determine where eliminations or reductions could be made in order to cut energy costs. Students develop and write a plan to reduce their family's energy cost.

FOLLOW-UP/BACKGROUND INFORMATION

The students may wish to chart their electric/gas bills monthly to see the impact of their behavior changes. A special award could be presented to anyone whose costs were reduced because of these changes.

The greatest savings of energy occurs with conservation of those things which consume the greatest amount of energy. Since heating and cooling our homes accounts for 70% of the total energy consumed, it would be wise to concentrate energy saving efforts here. 20% of the total energy consumed is used to heat water. This, too, is an area where energy-saving practices would more evidently effect changes. The remaining 10% is consumed to run small appliances. The refrigerator uses the most; followed by the electric dryer; then the oven. Other major users are the T.V., and lights by virtue of their constant use.

SOURCE OF ACTIVITY

Janey Swartz

______________________________, Come on down!!!

You are the next contestant on "Is the Price Right?"

APPLIANCE	COST PER HOUR	HOURS A MONTH IN USE	COST /MONTH	COST /YEAR
Water heater				
gas	$.01	______	____	____
electric	.05	______	____	____
Clothes dryer				
gas	$.09	______	____	____
electric	.31	______	____	____
Oven				
gas	$.03	______	____	____
electric	.08	______	____	____
Furnace				
gas	$.05	______	____	____
TV	$.02	______	____	____
Radio	.01	______	____	____
Stereo	.015	______	____	____
Light Bulb	.005	______	____	____
Electric blanket	.01	______	____	____
Hair dryer	.12	______	____	____
Toaster	.12	______	____	____
Air conditioner	.23	______	____	____
Wash machine	.02	______	____	____
Refrigerator	.015	______	____	____
Freezer	.015	______	____	____
Dishwasher	.08	______	____	____

What do you predict your electricity bill for the month? ________
gas bill for the month? ____________

Find out: actual electric bill ____________

actual gas bill ____________

TITLE Will It Still Be Fun?

SUBJECT Social Studies **LEVEL** Intermediate

ACTIVITY IN BRIEF

The student will make and play a game dealing with energy conservation

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OBJECTIVE

The student will become aware that great amounts of energy are consumed in recreation and entertainment.

MATERIALS	**TIME**
handouts (I-24a, I-24b) for each student poster board for each group	Awareness - 30 minutes Concept Development - 45-60 minutes Application - unlimited

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LEARNING CYCLE

AWARENESS - a shopping list is given to each student (I-24a). The student considers each item in terms of the energy consumed for it's production. The student also recommends ways certain items could be recycled.

CONCEPT DEVELOPMENT - The student designs a game board with a party theme. There will be a pathway with a beginning and an end. The direction cards will be cut apart and stacked in a pile..

APPLICATION - The students share and play their game with each other in groups of 3 or 4 players. Each player in turn will roll the dice, jump the pawn the designated number of spaces, draw a card and follow the directions. The first player to complete the circuit wins the game.

FOLLOW UP/BACKGROUND INFORMATION

Regulation game board size (19 x 19) is recommended. The directions (before they are cut apart) and the game board should be laminated for durability. A list of activities, recreational activities, and forms of entertainment is made by the class. They will note the items which utilize energy other than one's own body energy.

Primitive peoples, pioneers, Indians of yesteryear, etc. has little or no energy available in the form of electricity, gasoline for fuel, batteries, plastics, etc. yet they found ways to entertain themselves.

Compose a list of recreational activities and check off those activities which would be fun, yet would require little or no energy other than the expenditure of body energy.

The students will design a game using only items found in nature (sticks, rocks, water, etc.) They will take turns playing their games with each other.

SOURCE OF ACTIVITY

Janey Swartz

Let's Party!!

Shopping List		Energy-Wise List
Hot Dogs		
Buns		
Candles		
Cake Mix		
Ice Cream		
Napkins		
Plastic Forks		
Styrofoam Cups		
Paper Plates		
Balloons		
Streamers		
Wrapping Paper		
VCR and tape		
Pop		
Baggies		
Party-favors		
Garbage Bags		

Make the list "energy-wise". Suggest ways to recycle, recommend items to use, and think of substitutions to be made.

Someone drove you to the party could have walked. Go back five spaces.

You wrapped your gift with a magazine picture. For using recycled paper go ahead 2 spaces.

You rode your bike to town so you could buy a present. For saving gasoline, go ahead 4 spaces.

Styrofoam plates were used for the cake and ice-cream. Lose one turn for using a petroleum product.

Washable plates were used for cake. Move ahead 3 spaces for not using throw-aways.

Streamers were rolled up after the party for use at the next party. You get one extra turn for recycling

Everyone watches a movie on the VCR. Lose one turn for using electricity to have fun.

Outdoor games are played for entertainment. Take 1 extra turn. Only body energy was used.

Plastic utensils are used. Go back 3 spaces for using a petroleum product.

Hot Dogs are served. Go back 1 space for throwing away the plastic bun wrapper.

Punch made from 7-UP was served. Move ahead 1 space for recycling the plastic jug.

Each guest got a baggie of party favors. Go back 1 space for using a petroleum product (baggie) instead of a paper sack.

Styrofoam cups were used for lunch.party and you Go back 3 spaces for using a petroleum product.

You saved all the gift paper. You get 1 extra turn for recycling.

You saved the candles after blowing them out. One extra turn for recycling.

Cloth napkins were used. Move 2 spaces for not using a throw-away petroleum product.

Washable cups were used for punch. Move ahead 3 spaces for not using a petroleum product.

A disposable lighter was used for lighting the candles. Go back 1 space for buying a throw-away petroleum product.

Plastic garbage bags were used to collect garbage. Move back 1 space for using a petroleum product.

The lights and TV were on in other rooms and no one was using them. Move back 2 spaces.

Guests left quickly, closing doors behind them. Take 1 extra turn for saving heating or cooling energy.

Water for drinking was kept in the refrigerator. Move ahead 3 spaces for not running and wasting water to cool it.

Hot dogs were cooked over the fire outside. Move ahead 3 spaces for saving the stove's energy.

TITLE The Energy Patrol

SUBJECT All areas **LEVEL** Intermediate

ACTIVITY

Students form an energy patrol and supervise a major component of energy conservation in their school. They check for lights in empty rooms, record classroom temperatures and make observations about energy being consumed.

OBJECTIVE

Students will be able to measure the impact of their actions upon the school's energy consumption and costs.

MATERIALS	TIME
energy patrol certificate energy patrol bands monitor lists - I-25b	ongoing throughout the month (10 min/day for monitoring)

LEARNING CYCLE

AWARENESS - The principal presents the energy patrol certificate to the class. (See I-25a) The authority is given to the class to monitor and supervise energy conservation measure and to effect changes where necessary to guarantee reduced energy consumption and costs. The challenge is to see a noticeable decrease in energy consumption made evident through monthly meter readings. The students learn how to read a meter. They record and date the school meter reading.

CONCEPT DEVELOPMENT - The students develop a check list of areas to monitor (see I-25b). Students are assigned on-duty patrol days. ENERGY PATROL bands should be worn. Each morning 2 patrol members will check to see how much electricity has been used since the previous morning. Two other patrolers check empty classrooms for lights during recess, lunch periods, and after school. Rooms with lights off will get a happy-face "Save-a-Watt" sticker. Those wasting energy are reminded with a sad-face "Save-a-Watt" sticker. Before the patrol commences its daily duties, a school-wide announcement will be made to inform the other classes about the patrol.

APPLICATION - Data is collected for a designated span of time (a month is recommended). The data is evaluated to see if any savings were made. Recommendations are made as to how the school can further cut the energy cost. An assembly will be held to report any findings and to present awards to the most energy efficient rooms. Recommendations will be made and the entire school will be challenged to reduce energy consumption through its united effort.

FOLLOW-UP/BACKGROUND INFORMATION

Here are some recommendations to consider:

The thermostat could be adjusted (reduced) in different parts of the building depending on use. (For example, lower temperatures could be kept in the gym due to higher activity levels there.)

Students could be encouraged to keep extra layers of clothing at school, enabling them to adjust their needs to temperature fluctuations, also allowing the thermometer to be lowered a few degrees.

Curtains could be opened or closed to control temperature. Open curtains for extra heat, shut them for cooling purposes.

Registers could be closed in rooms not being used.

Students should report windows and doors that require caulking or weatherstripping.

Children can be encouraged to quickly enter and exit through doorways to prevent heat loss or gain. A monitor could be posted at doorways during morning arrival, recess, and afternoon departure.

Fresh air ventilation instead of air conditioning could be used when possible.

An energy audit could be made for the school and recommendations by the officials could be presented to the class. This information could also be relayed to the other classes by the Special Patrol reporters.

This could be an ongoing project throughout the school year. The challenge would be to see continued energy savings monthly. Of course, there will be season fluctuations which need to be understood and appreciated by the students. The students are challenged to be constantly thinking of ways to save energy all year long.

SOURCE OF ACTIVITY

Adapted from The Energy Patrol project at North Scott Community School District, and Tom Fredricksen.

This certificate hereby proclaims

the formation and development

of the

Energy Patrol

with the students in ____________________ class
Teacher's Name

The purpose of this distinguished honor is to encourage the pursuit and continuance of energy conservation measures by the students of ____________________
Name of School

____
Date

____
Principal's signature

____
Teacher's signature

I-25b

Dressing for Energy Conservation

Week #_____

Dates					

☐ Are warm clothes worn on cold days and light clothes worn on warm or hot days?

Temperature Patrol

1-25b

Record the temperature for each day.
Take it at different times of the day.

Week #_____

Date →					
Hallway					
Gym					
Restroom					
Office					

Check:

☐ Temperature is OK without being too warm.

☐ Curtains are opened when the sun's heat is needed and closed when the sun's heat is not needed.

☐ Warm clothing is worn on cold days and light clothing is worn on warm or hot days.

Light Patrol

Date each check. Be sure to check at different times of the day, such as lunchtime, recess, and before and after school.

☺ means good conservation of electricity.

☹ means waste of electricity.

Date →

Week #_____

Hallway					
Gym					
Restroom					
Office					

Check:

☐ Lights are turned off next to windows where sunlight can be used.

☐ Lights are turned off in hallways, classrooms, closets, etc. when not in use.

TITLE Puppet Power

SUBJECT Language Arts, Art **LEVEL** Intermediate

ACTIVITY

Students will write and produce a puppet show as a culmination to the energy unit. The puppets will be the medium to teach good conservation practices.

OBJECTIVE

The students will share their energy conservation values with others.

MATERIALS	TIME
an assortment of items to be recycled into puppets	2-3 class sessions 45-60 minutes each puppet creations - variable as needed

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LEARNING CYCLE

AWARENESS - The students will brainstorm a list of ways energy can be conserved in homes, schools, and communities.

CONCEPT DEVELOPMENT - The students, working in pairs, will rewrite their ideas into a puppet show that will help others learn about energy conservation. The students will create the puppets for their play using only recycled products. This could be done in class, at home, or in an art class.

APPLICATION - The students will present their plays to other students and/or classes.

FOLLOW-UP/BACKGROUND INFORMATION

A broad variety of concepts should be encouraged. A sign-up would guarantee a variety of ideas for the final outcome. Students should sign up for the conservation practice they want to incorporate in their production (they may want to expand upon several ideas). The plays could be presented at an all-school assembly. One group of students could be assigned to make a program to hand out for assembly audience. The program could be an additional tool to reinforce the values being taught in the puppet show. It also would be a means to advertise the names of the puppet show participants.

SOURCE OF ACTIVITY

Karen Steffen